SIEMENS

SIMATIC

Process Control System PCS 7 V7.0 Programming Instructions for Blocks

Manual

11/2006
A5E00807905-01

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring to property damage only have no safety alert symbol. The notices shown below are graded according to the degree of danger.

Danger
indicates that death or severe personal injury **will** result if proper precautions are not taken.

Warning
indicates that death or severe personal injury **may** result if proper precautions are not taken.

Caution
with a safety alert symbol indicates that minor personal injury can result if proper precautions are not taken.

Caution
without a safety alert symbol indicates that property damage can result if proper precautions are not taken.

Notice
indicates that an unintended result or situation can occur if the corresponding notice is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel.** Within the context of the safety notices in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

Warning
This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.
Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG.
The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens AG
Automation and Drives
Postfach 4848
90437 NÜRNBERG
GERMANY

A5E00807905-01
11/2006

Preface

Purpose of the Programming Instructions

These Programming Instructions describe how to create PCS 7-compliant PLC blocks or faceplates.

The essential differences between a PCS 7-compliant PLC block and a straightforward S7 block are as follows:

- The option of **monitoring** parameter values in a faceplate
- The option of **controlling** parameter values and therefore the way the block executes in a faceplate
- The option of sending **messages** relating to asynchronous events and block states to the OS and to display these messages in a faceplate or a WinCC message list.

Audience

These programming instructions are intended for developers of automation blocks (PLC blocks) and/or faceplates that will be used and fully integrated in the same systems as the PCS 7 process control blocks supplied by Siemens.

Requirements

To use these programming instructions, you therefore require experience in the development and application of PLC blocks and faceplates and should be familiar with the relevant hardware and software. These instructions describe only the measures necessary to achieve conformity between blocks you have created yourself and the PCS 7 blocks. Where necessary, you will find further information in the documentation listed in the References at the end of this manual.

You will find general information on the use of PCS 7 components in the PCS 7 Configuration Manual.

General Outline

These programming instructions provide you with an overview of the individual components of a PCS 7-compliant block. The order in which they are introduced is the same order you would follow to develop function blocks and faceplates.

- You develop the "CONTROL" PLC block, a simple controller block, step by step by first defining the block header, the parameters of the block and its local variables. You then create the source code.
- The next step is to develop a faceplate. You create this with the WinCC Graphics Designer and the elements of the Faceplate Designer.
- The last step is to develop an online help system for the block and then a shippable library MYLIB made up of all the components.

As you work through the instructions, you will see the sections of the sample block required to understand the current topic. Section 1.11 contains a printout of the entire sample PLC block.

In the appendix, you will find a sample source code for MEAS_MON, MOTOR and VALVE blocks contained in the PCS 7 library, as an example of PCS 7-compliant blocks. You can use this source code - or part thereof - as a template for your own blocks.

Note

The use of the sample source code contained in the appendix is the responsibility of the user. There is no guarantee for error-free display.

Further Support

If you have any technical questions, please get in touch with your Siemens representative or agent responsible.

You will find your contact person at:

http://www.siemens.com/automation/partner

You will find a guide to the technical documentation offered for the individual SIMATIC Products and Systems here at:

http://www.siemens.com/simatic-tech-doku-portal

The online catalog and order system is found under:

http://mall.ad.siemens.com/

Training Centers

Siemens offers a number of training courses to familiarize you with the Process Control System PCS 7 automation system. Please contact your regional training center or our central training center in D 90327 Nuremberg, Germany for details:

Telephone: +49 (911) 895-3200.

Internet: http://www.sitrain.com

Technical Support

You can reach the Technical Support for all A&D products

- Via the Web formula for the Support Request
  http://www.siemens.com/automation/support-request
- Phone: + 49 180 5050 222
- Fax: + 49 180 5050 223

Additional information about our Technical Support can be found on the Internet pages http://www.siemens.com/automation/service

Service & Support on the Internet

In addition to our documentation, we offer our Know-how online on the internet at:

http://www.siemens.com/automation/service&support

where you will find the following:

- The newsletter, which constantly provides you with up-to-date information on your products.
- The right documents via our Search function in Service & Support.
- A forum, where users and experts from all over the world exchange their experiences.
- Your local representative for Automation & Drives.
- Information on field service, repairs, spare parts and more under "Services".

Contents

1 Creating AS blocks

1.1 Requirements and previous experience

1.1.1 Introduction

Requirements

Prerequisite for the creation of AS blocks:

- PCS 7 V6.1 or higher installation on S7-4xx CPU
- Software packages required to create the blocks:
  - STEP 7 Basis V5.2 or higher
  - SCL Compiler V5.1 SP4 or higher
  - CFC V6.0 or higher

Additional information re SCL

AS blocks for PCS 7 are programmed using SCL.

For further information on SCL, refer to:

- The SIMATIC Manager Online Help:
  Select **Call help on optional packages > Programming blocks with S7 SCL**
- *S7 SCL Getting Started* manual
- *S7-SCL for S7-300 and S7-400* manual

These manuals are available at **Start > Simatic > Documentation**.

Information on user DBs

These instructions do not cover the creation of data blocks (DBs). When creating your own DBs in addition to function blocks (FBs):

- Use a DB number within the range from 1 to 60 which is reserved in CFC for other applications This rules out any conflict between the instance DBs generated by the CFC compiler and the user DB numbers
- Any change of the default range of numbers in the CFC forces you to download all configuration data while the CPU is in stop You can edit the default range of numbers in CFC by selecting the **Tools > Settings for compiling / downloading** command

1.1.2 How to integrate the included block template into your project

Path

The "CONTROL" block described in this section represents the SCL source file CONTx.SCL included on the PCS7 toolset DVD. Install it at one of the paths shown below, depending on your language settings:

- German: ...\STEP7\EXAMPLES\zdt25_01\S7_CONTA.SCL
- English: ...\STEP7\EXAMPLES\zen25_01\S7_CONTB.SCL
- English with French installation: ...\STEP7\EXAMPLES\zfr25_01\S7_CONTC.SCL.

Procedure

To install the sample block in your project:

1. Select the source folder in your project, and then select **Insert > External Source…**
   The "Insert external source" dialog box opens
2. Select the folder which contains either the "S7_CONTA.SCL" or "S7_CONTB.SCL" source file, and then click "Open"
   Compile the SCL source file which is now in the source folder using the SCL compiler
3. Verify that the "OP_A_LIM" block (FB 46) is located in the block folder of your project before you run the compiler Copy it from the PCS 7 library to your project if not available in this folder
4. Check the SCL compiler settings (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)
5. Edit the entries shown below in the symbol table:
   - Enter the symbolic name "CONTROL"
   - Enter the FB501 address
   - Save your entries

   Always use numbers higher than 500 in order to avoid conflicts with the numbers of the PCS 7 default blocks.
   See also the "Entry in the symbol table" section in chapter 1.2.1.
6. Double-click the SCL source "S7_CONTA" or "S7_CONTB"
   The program opens the required SCL source
7. Start compilation and close the SCL Compiler on successful completion

The sample block FB501 is now located in the block folder of your project.

1.2 Structure of an AS block

AS blocks can only be executed within the PCS 7 system if specific formal and content-related criteria are met. The next chapters describe the essential measures you have to take in order to meet these criteria.

The block diagram below shows the basic structure of "CONTROL" block FB501. Detailed information on the various block elements is available in the corresponding chapters.

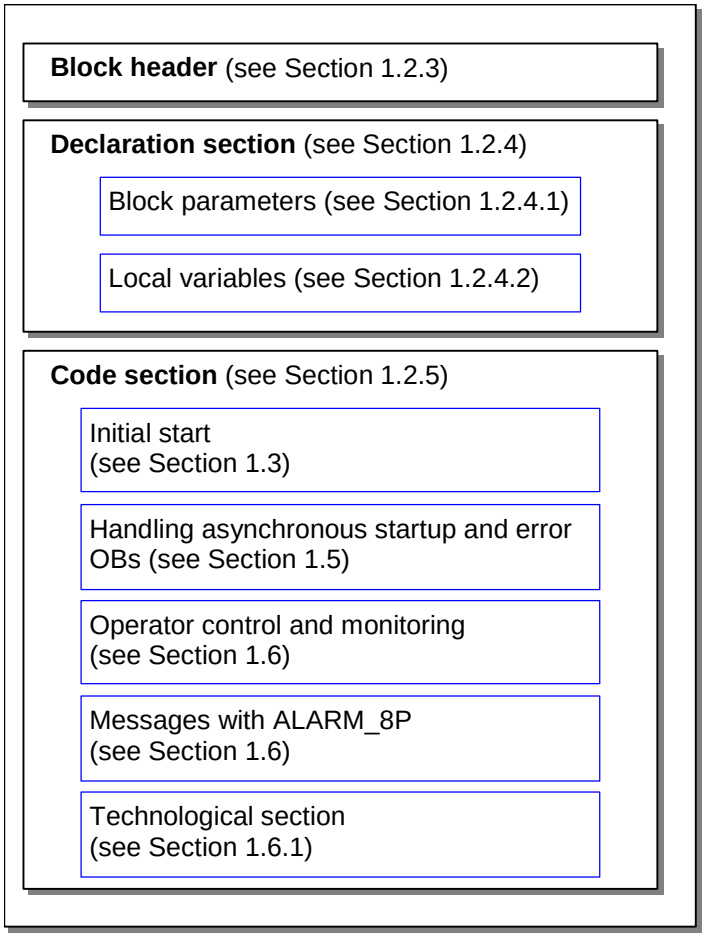


Fig. 1-1: Structure of the "CONTROL" sample block (FB501)

Function block or function

Implement your block as FB in order to integrate functionality for saving values, for reporting, and for operator input and monitoring. The FB features a memory in the form of an instance DB.

It is also possible to implement the block as a function (FC) if you do not require the properties mentioned earlier.

1.2.1 SCL Compiler settings

Default settings for "Generate blocks"

The SCL Compiler supports the configuration of specific options. Open the corresponding dialog by selecting **Options > Settings > Generate blocks**.

- **Overwrite blocks**
  - Overwrites blocks in the "Blocks" folder of an S7 program if the compiler has generated blocks with the same name
  - Overwrites blocks of the same name in the target system during downloads

  If this option is not enabled a message prompts you to confirm overwriting of the block.
- **Display warnings**

  Defines whether to output warning messages in addition to error messages after compilation.
- **Display errors before warnings**

  Defines whether errors are listed before warnings in the message.
- **Generate reference data**

  Automatically generates a block plus reference data

  Select **Options > Reference data** in order to generate or update the reference data at a later time.
- **Include system attribute "S7_server"**

  You set this option to include the system attribute of parameter "S7_server" when the compiler generates a block. Assign this attribute to the parameter if relevant to the configuration of connections or messages. The parameter contains the connection numbers and/or message numbers.

Note

(for this example)

Always set the "Include system attribute "S7_server" check box because this block contains messages. If the check box is not set the program returns an error message and cancels any operation which imports a block and/or inserts a block into a CFC chart.

"Compiler" settings

You can activate/deactivate the check boxes listed below in the SCL Compiler by selecting **Options > Customize > Compiler**.

- "Monitor field limits"
- "Generate debug info"
- "Set OK flag"

It is advisable to activate all remaining check boxes. For further information on the various options, refer to the SCL manual.

Make allowances for conditions outlined below when you activate/deactivate any of these options:

- **Monitor field limits**

  At runtime, the program validates the range of the array index and field length declaration of any arrays used. The program toggles the OK bit and resets the ENO output when an error is detected. This validation imposes a considerable load on the runtime system.

  Activate this option only as long as necessary when validating arrays, i.e. reset it after you successfully completed the block test and verified that the index matches the field length.

- **Generate debug info**

  This option enables you to debug the compiled program after its download to the CPU. However, this option increases memory requirements of the program and load on AS runtime. You should therefore activate this option only for block testing and deactivate it in its delivered version.

- **Set OK flag**

  The OK flag is an internal system variable. When the system detects an error such as overflow in mathematical operations during execution of an operation, it toggles the OK bit and transfers this bit information to the ENO output. This validation generates considerable load on system performance. You should for this reason disable automatic setting of the OK flag and capture any illegal operations or violation of limits in the actual block algorithm. You can explicitly set the OK flag when the system returns an error in order to transfer the information via the ENO output. The system accepts this operation without loss of performance, as it always transfers the status of the OK flag to the output.

1.2.2 SIMATIC Manager settings

User interface language

The user interface for PCS 7-compliant AS blocks must be available in English language. This applies, for example, to parameter names and comments. However, users can develop the actual blocks in any regional language.

Selecting the regional language

You also have to set the English language in the "Regional and language options" dialog when you collect the blocks in a library (cf. chapter 4.1) With this setting, you assign PCS 7-compliant names such as "Sources", "Symbols" and "Blocks" to the various catalogs of your library. Open SIMATIC Manager, and then select **Options > Customize > Language** in order to set "English" as regional language and for mnemonics.

Entry in the symbol table

The block name entered in the block header must be saved as symbolic name to the symbol table.

To enter the block name in the header:

1. Double-click "Symbols" in the S7 program
   The symbol table opens
2. Type the symbolic name, in this case "CONTROL", into the "Symbol" column
3. Type a FB number, "FB501" in this case, into the "Address" column
4. Type a text into the "Comment" column to describe the block function in detail (max. 80 characters).

   This comment is a useful supplement to the symbolic block name, as the information returned by the block name itself is usually inadequate to describe the purpose and functionality of a block.
   This block comment corresponds with the symbol comment returned in the detail view or object properties of the block in SIMATIC Manager.

   The text of the block comment appears in the header of the instance block when you insert the block into a CFC chart. You can edit this comment independent of the entry in the symbol table in order to adapt it to a specific instance.

Note

The number of characters shown is limited by the width of the CFC blocks. However, you can temporarily view the entire comment in a short info by positioning the mouse pointer on the block header.

5. Save and close the symbol table

For further information, refer to section 1.10, naming conventions and range of numbers.

1.2.3 Block header

Block attributes

The block header contains the block management information (block attributes in the following). The various PCS 7 tools deploy these attributes for different purposes. SIMATIC Manager shows the attributes in the object properties of the block and lets you edit these (cf. the KNOW_HOW_PROTECT attribute).

Header of the block template

Extract from the block template:

```
//Copyright (C) Siemens AG 1999. All Rights Reserved. Confidential
(*************************************************************************
  BRIEF DESCRIPTION:

  This block provides an example of the development of a
  PCS 7-compliant AS block.

  It is used to implement a simple control algorithm according to the formula:
  Manipulated variable = gain * (setpoint - actual value)

  If the process value overshoots the high alarm limit the system sets error
  output QH_ALM. In addition, it generates a message in ALARM_8P and outputs
  it to the OS.
  The message can be suppressed by setting the M_SUP_AH variable.

  If the process value undershoots the low alarm limit the system sets error
  output QL_ALM. In addition, it generates a message in ALARM_8P and outputs
  it to the OS.
  The message can be suppressed by setting the M_SUP_AL variable.

  The block supports SIMATIC BATCH and provides the corresponding
  parameters BA_EN, BA_NA, BA_ID, OCCUPIED and STEP_NO.

  The block contains additional inputs which can be used to return information
  about a delay function:

  Output SUPP_OUT follows input SUPP_IN o expiration of a configurable Waiting
  time SUPPTIME.

..*************************************************************************)


//Creator: ABC Date:   13.08.00       Vers.:1.00
//Changed:             Date:   18.11.03       Vers.:
//Change:

//*************************************************************************
// Block header
//*************************************************************************

FUNCTION_BLOCK "CONTROL"
TITLE =        'CONTROL'

{  // List of system attributes
S7_tasklist:= 'OB80,OB100';// The block is called on timeout error or restart
S7_m_c:=    'true';       // The block can be controlled and monitored
S7_alarm_ui:= '1' // PCS7 message dialog setting('0'= default message dialog)
}
AUTHOR:  ABC
NAME:       CONTROL
VERSION:         '0.02'
FAMILY:  XYZ
KNOW_HOW_PROTECT
```

Object properties of the compiled block template

The screenshots below show the object properties of the compiled block template, including cross-references to the relevant attributes of the block header.

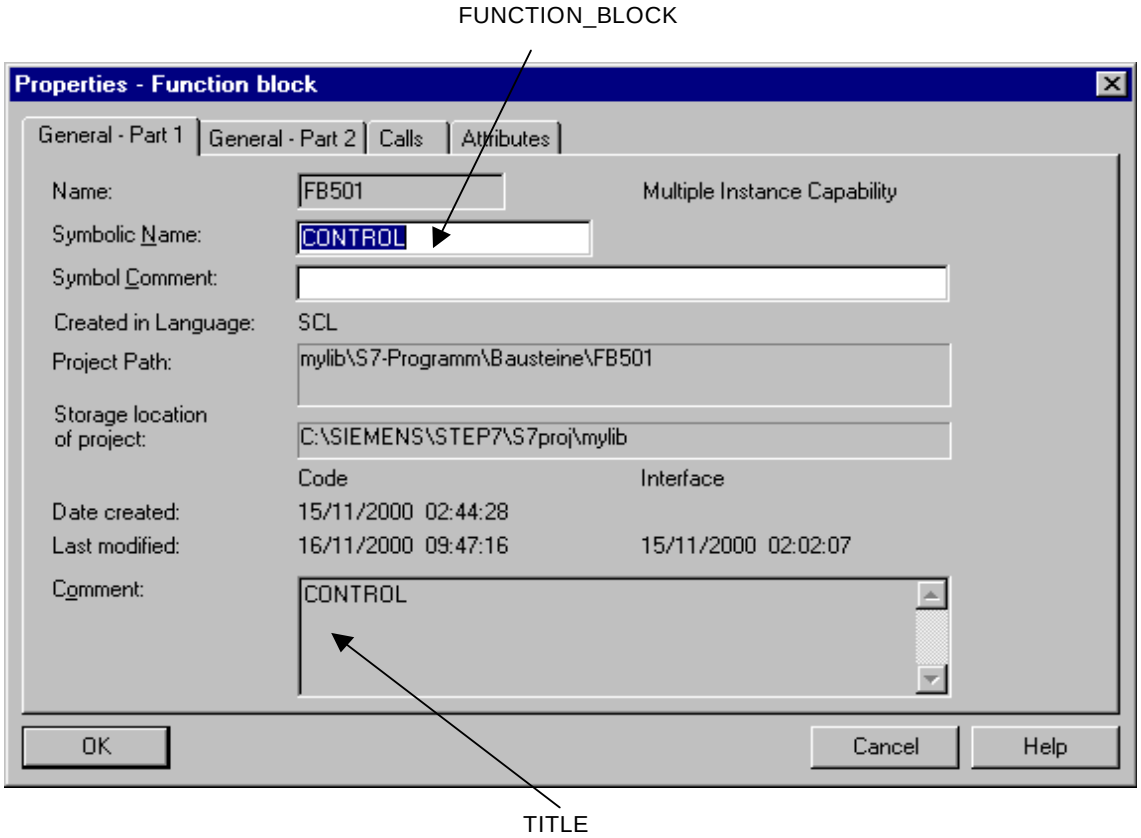


Fig. 1-2: Object properties of the block (General - part 1)

- **FUNCTION_BLOCK**

  Define a block name with a maximum string length of eight characters at this parameter. This name appears in the object properties of the block, in the detail view of SIMATIC Manager, and in the CFC catalog. Assign this name a block number in the symbol table before you compile the block.

- **TITLE**

  PCS 7 does not evaluate this information. However, SIMATIC Manager shows it in the comment field of the object properties of the block. SIMATIC Manager includes comments entered directly below this attribute. All other comments in the block headers can only be viewed in the SCL editor.

  It is advisable to enter a brief description of the block in this dialog.

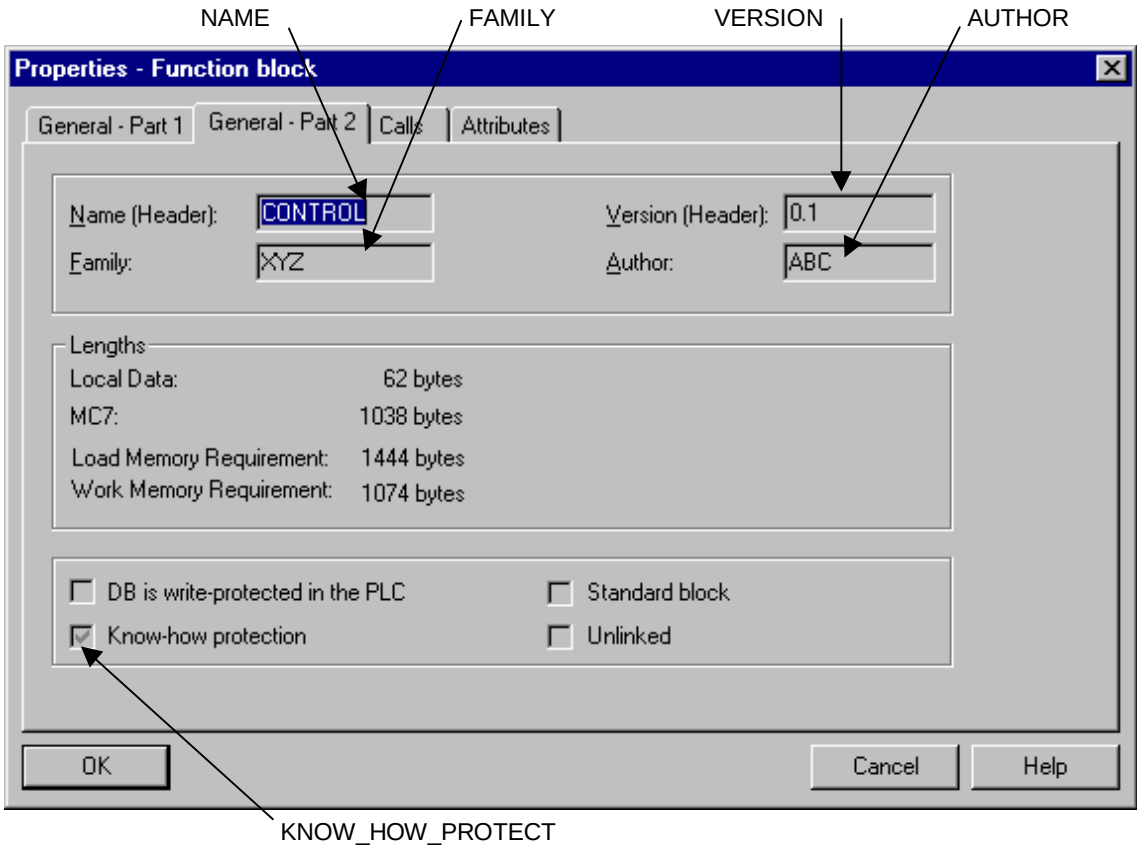


Fig. 1-3: Object properties of the block (General - part 2)

- **NAME**

  Enter the block name you already defined at "FUNCTION_BLOCK".

  The NAME" and "FAMILY" strings are elements of the keywords used to find help texts in the block's online help.

- **VERSION**

  Enter a version ID from 0.00 to 15.15 at this parameter.

- **FAMILY**

  Enter a group name for the block at this parameter when collecting your blocks in a user-specific library and assigning these to different groups. Enter a name with a maximum string length of eight characters

  The "NAME" and "FAMILY" strings are elements of the keywords used to find help texts in the block's online help (cf. chapter 3.3).

- **AUTHOR**

  This attribute usually contains the name or department of the block's creator. The attribute is also used for two other functions at PCS 7-compliant blocks:

  - Enter a name shared by all blocks you want to group in your library Enter a name with a maximum string length of eight characters
  - This name is used to find the relevant help file in the online help system

- **KNOW_HOW_PROTECT**

  You can read and write protect the block algorithm and attributes by setting this attribute. Effects of this attribute:

  - It sets the read only flag for the block attributes in the object properties dialog of the block in SIMATIC Manager
  - Offline of the project and if the corresponding source code is not available you can only open the block in the STL editor. You can no longer open it in SCL. Only the block parameters are displayed
    The SCL Compiler is started within your project

- **List of system attributes for blocks**

  System attributes are used to prepare a block for connections to the OS. Attribute "S7_m_c", for example, defines whether or not the block is relevant to an OS. If yes, the system generates the necessary internal data structures in the OS. System attributes can also be used to control installation of a block in a CFC chart. Attribute "S7_tasklist", for example, defines in which OBs the block is installed automatically.

Table 1-1: System attributes for PCS 7-compliant blocks

System attribute	Meaning	Default
S7_tasklist	Contains a list of OBs such as error / startup OBs in which the CFC has to install the block.	no multiple instances are installed
S7_m_c	Defines whether the block can be controlled and monitored at an OS.	false
S7_alarm_ui	Message server ID: S7_alarm_ui:='0' default message dialog S7_alarm_ui:='1' PCS 7 message dialog	0
S7_tag	If this system attribute has the value 'false', the block is not entered in the tag list of the OS and cannot be selected for "Loop in Alarm" on the OS. This is useful for dedicated message blocks which do not have a faceplate. The block is entered in the tag list if the system attribute is not available and the block is assigned system attribute "S7_m_c".	true
S7_driver	ID for the signal preprocessing driver block. This block is automatically interconnected with the corresponding block by means of the CFC function "Generate module drivers" in SIMATIC Manager. Values: 'chn', 'f'	
S7_hardware	ID of a module-specific driver block which is automatically inserted into the CFC chart, and is configured and interconnected by means of the CFC function "Generate module drivers" in SIMATIC Manager. Values: 'subnet', 'rack', 'sm', 'im', 'fm'	
S7_read_back	Defines whether the block instance is to be allocated to the "Chart > Readback" function in the CFC. The instance block parameters cannot be read back when the value of this system attribute is 'false'.	true

SIMATIC Manager shows the system attributes in the object properties of the block on the "Attributes" tab. You can edit the system attributes on this tab if the block is not write-protected. The block is not write protected if the "KNOW_HOW_PROTECT" attribute is disabled in the block header.

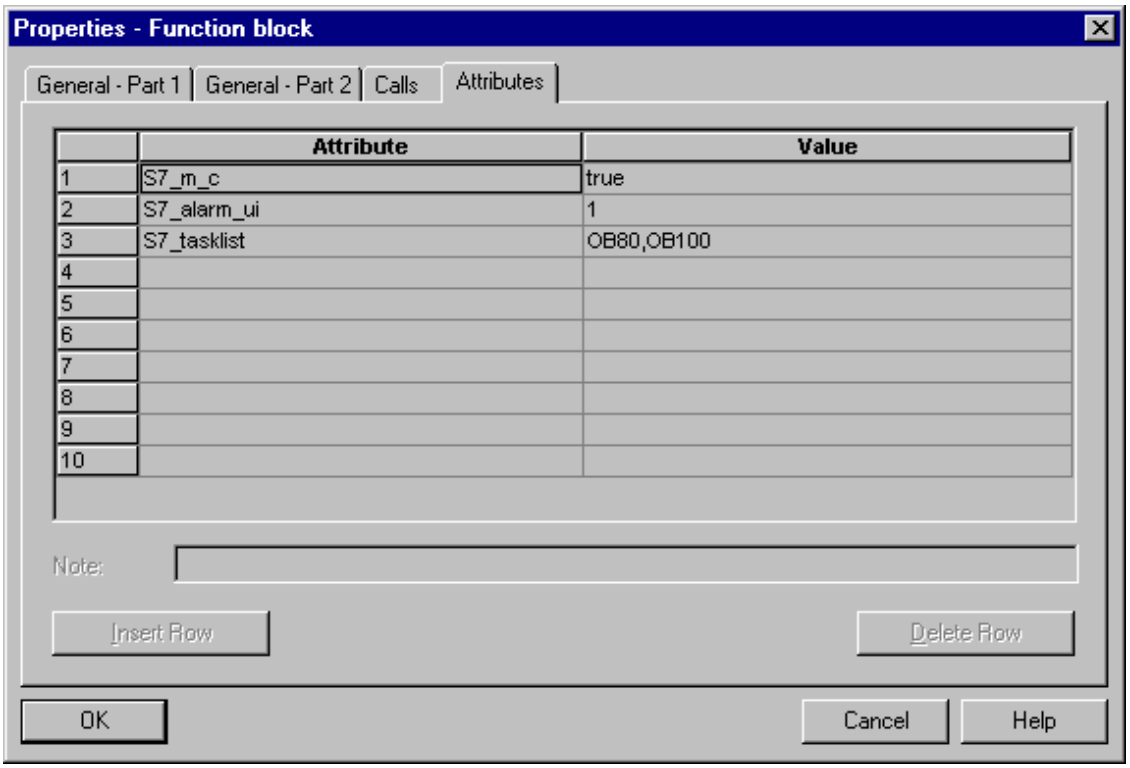


Fig. 1-4: System attributes of the block

Note

You can view a list of all system attributes by calling the context-sensitive help or the help topic "Attributes for blocks and parameters".

1.2.4 Declaration section

1.2.4.1 Block parameters

Block interface

The block's parameters define its interface to other blocks and to control and monitoring tools such as CFC and WinCC.

Parameter types

Parameter types available:

- **Input parameters**

  Operations for which input parameter functions must be declared for PCS 7-compliant blocks:

  - You want to fetch parameter values from another block
  - You want to control parameters at the OS
  - You want to define visualization of a faceplate on the OS with the help of parameters. Example: range limits of the views.
  - You want to be able to manipulate parameters in CFC for test purposes
  - You need parameters such as Message Event-ID of the ALARM_8P block to generate messages
  - If you require bumpless changeovers between input values from the program (CPU) and control values entered by the operator (OS), the input parameters can be read back and written back (see in/out parameters) by the block algorithm. By contrast to the in/out parameters, the input parameters are not written back to the interconnected output parameters

- **Output parameters**

  Operations for which output parameters must be declared for PCS 7-compliant blocks:

  - You want to transfer parameter values to another block
  - You want to monitor parameters at the OS
  - You want to monitor parameters in CFC when running tests

- **In/out parameters**

  In/out parameters can be read back and written back by the block algorithm. In/out parameters must be declared for PCS 7-compliant blocks when you require a bumpless changeover between input values from the program (AS) and manipulated values (OS). You need three parameters to implement this functionality:

  - One input parameter for changeover
  - One input parameter for the interconnected value
  - One in/out parameter for the manipulated value
    This must be an in/out parameter, as the interconnected value must be written back to the manipulated value This method ensures the bumpless changeover from the interconnected to the manipulated value

Comments for parameters

In order to add comments to the block parameters, append the separator "//" to the parameter definition and then enter your comments.

Comments are displayed in the CFC chart in the object properties of the I/O and in the object properties of the block in the "Inputs/Outputs" tab. You can edit the comments on this tab, irrespective whether or not the "KNOW_HOW_PROTECT" attribute has been set in the block header.

System attributes for parameters

Similar to the block declaration, you can enhance your block parameter declaration using system attributes.

Definitions in particular:

- Representation of the parameter on the OS
  Example: "S7_unit" defines the parameter unit such as "liter". You can view the text defined at this attribute in your faceplate.
- Whether and how the parameter is handled in CFC
  Example: "S7_visible" defines whether or not the parameter is displayed in the CFC chart

Table 1-2: System attributes for parameters of PCS 7-complaint blocks

System attribute	Concerns	Meaning	Default
S7_sampletime	Sampling time	A parameter with this system attribute is automatically assigned the cycle time of the calling watchdog interrupt OB. Set the "Update scan time" check box accordingly when you compile the CFC chart (cf. chapter 1.4).	false
S7_dynamic	CFC	A parameter assigned this system attribute is automatically registered for testing in CFC test mode.	false
S7_edit	CFC	Defines whether to include the parameter in the "Edit parameters/signals" table for editing in SIMATIC Manager without opening the CFC chart.	false
S7_link	CFC	Defines whether the parameter can be interconnected in the CFC.	true
S7_param	CFC	Defines whether the parameter can be programmed in the CFC	true
S7_visible	CFC	A parameter with system attribute status 'false' is not visualized in the CFC chart.	true
S7_qc	CFC, O&M	This attribute identifies parameters which provide the quality code in addition to the process value. The quality code declaration in the interface must be appended as next parameter immediately after the process value. The process value may be of any data type, however, the quality code must be of the data type "BYTE".	false
S7_contact	SFC	Parameter belongs to a connection group	false
S7_m_c	O&M	Defines whether the operator can control and monitor the parameter at an OS	false
S7_shortcut	O&M	Contains the parameter name with a maximum string length of 16 characters. This name, for example "setpoint" can be output to a faceplate on the OS.	
S7_string_0	O&M	This system attribute is only useful for input or in/out parameters of the data type BOOL. It contains a text, for example "Open Valve", with a maximum length of 16 characters which can be output to a faceplate. The parameter is assigned the value 0 when this control function is executed.	
S7_string_1	O&M	This system attribute is only useful for input or in/out parameters of the data type BOOL. It contains a message text, for example "close valve", with a maximum length of 16 characters which can be output to a faceplate. The parameter is assigned the value 1 when this control function is executed.	
S7_unit	O&M	Contains the name of the parameter's physical unit, with a maximum length of 16 characters. The unit, for example "mbar", can be displayed in the CFC at the block I/O.	
S7_server	Server	The interface parameter is assigned to a server. Message server: S7_server:='alarm_archiv'	No server call
S7_a_type	Message server	The interface parameter is the message number input of message class x or the archive number input	

Using and editing system attributes

Also to be observed when using the "S7_string_0" and "S7_string_1" system attributes:

The specified value can be output as message text to the faceplate. The program transfers the logic value 0 or 1 to the AS when the operator executes the function. The CFC always returns the actual value of the parameter. You can also adapt this value output using the system attribute.

Split the value of the system attribute into two parts using an equal sign as separator. Example, S7_string_1 := 'Suppress HH =YES'. The CFC recognizes the equal sign and replaces the value output at the parameter with the element appended to the equal sign. In this case, the program outputs the word "YES" instead of value 1.

The CFC only outputs up to eight characters, regardless of any additional characters you may have entered. The operating log always outputs the full text. In this case: "Suppress HH =YES".

The CFC outputs the system attributes in the object properties of the relevant connection. These data can be edited. The screenshots below show the object properties of BOOLEAN parameters and of parameters that are not of the data type BOOL (Fig. 1-6). The pictures also contain cross-references to the relevant system attributes.

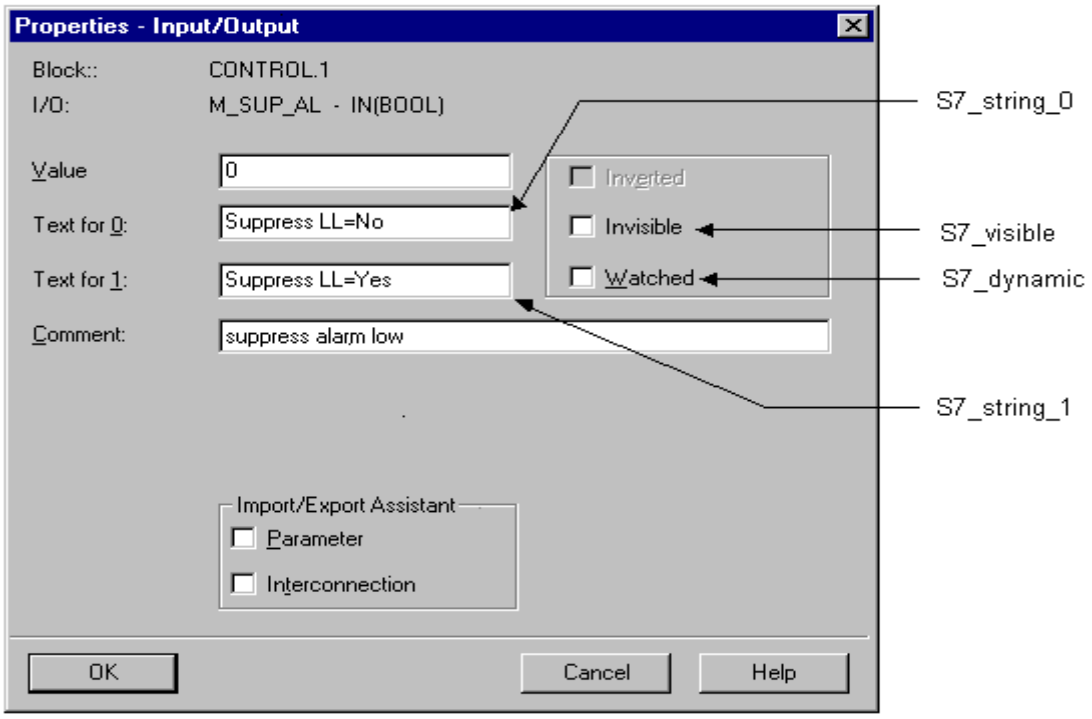


Fig. 1-5: Object properties of BOOLEAN parameters

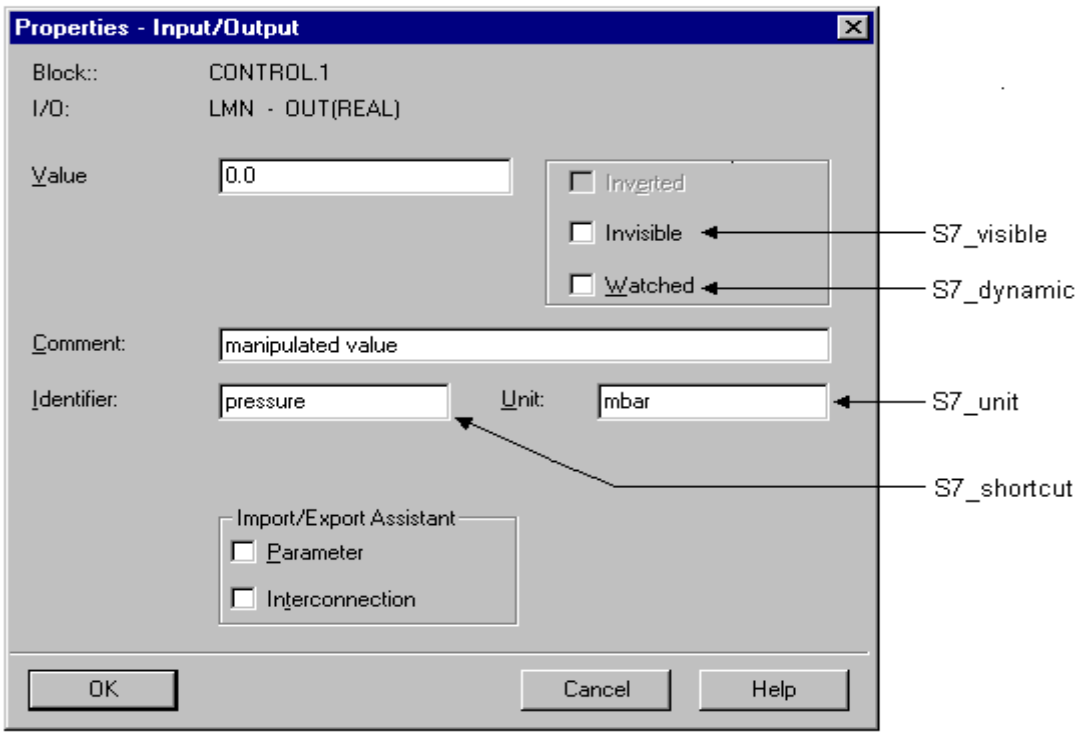


Fig. 1-6: Object properties of non-BOOLEAN parameters

Coding of the block parameters

The extract from the block template below shows the coding of block parameters:

```
//*****************************************************************************
// Declaration section: Block parameters
//*****************************************************************************
VAR_INPUT
SAMPLE_T {S7_sampletime:= 'true';  // Parameter of the block scan cycle
                                   // (Task cycle)
       S7_visible:='false';          // Parameter is hidden
       S7_link:= 'false'           // Parameter cannot be not interconnected
      }          :REAL := 1;       // Delay [s] (default = 1 s)

  H_ALM {S7_m_c := 'true';
     S7_visible:='false';
     S7_link := 'false'}  :REAL :=100;  // high limit alarm
                                        // (default = 100)
  L_ALM {S7_m_c := 'true';         // Parameter supports O&M
     S7_visible:='false';            // Parameter is hidden
     S7_link := 'false'           // and cannot be interconnected
     }           :REAL := 0;       // low limit alarm (default = 0)

  M_SUP_AL {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_string_0:= 'Suppress LL=No';    // Message text for value (M_SUP_AL) = 0
    S7_string_1:= 'Suppress LL=Yes'    // Input text for value (M_SUP_AL)= 1
      }           :BOOL := 0;          // Suppress low alarm message
  M_SUP_AH {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_string_0:= 'Suppress HH=No';
    S7_string_1:= 'Suppress HH=Yes'
      }           :BOOL := 0;             // Suppress high limit alarm message

  SP_OP_ON {S7_visible:='false';
      S7_dynamic:='true'     // CFC in test mode/IBS: Display of the actual
                             // value in the AS)
      }       :BOOL := 1;    // 1 = enable setpoint input

  SPBUMPON {S7_visible:='false';
       S7_link:='false';
       S7_m_c:='true';
       S7_string_0:='SP bumpless=Off';
       S7_string_1:='SP bumpless=On'
      }
                 :BOOL := 1;      // 1 = bumpless input of setpoint
  SP_EXTON {S7_visible:='false';
      S7_dynamic:='true'     // CFC in test mode/IBS: Display of the actual
                             // value in the AS)
      }
                :BOOL := 1;         // 1: Enable external setpoint
  SP_EXT   {S7_dynamic:='true'}
                 :REAL := 0;        // External setpoint

  SP_HLM   {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_shortcut:='SP high limit';     // Text (max. 16 chars) for display on OS
    S7_unit:=''}                      // Unit (max. 16 chars)
               :REAL := 100;            // High limit of setpoint input

  SP_LLM    {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_shortcut:='SP low limit';
    S7_unit:=''}
               :REAL := 0;           // low limit of setpoint input

PV_IN {S7_dynamic:='true';
    S7_m_c:='true';
    S7_unit:='%'} :   REAL := 0;      // Process value (for Begleitwert_PR04)

GAIN   {S7_link:='false';
    S7_edit:='para';                  // Parameterization in the IEA
    S7_m_c:='true';
    S7_shortcut:='Gain';
```

```
    S7_unit:=''}        :REAL := 1;   // Proportional gain

  EV_ID   {S7_visible:='false';
    S7_link:='false';
    S7_param :='false';              // Parameter cannot be programmed in CFC
    S7_server:='alarm_archiv';        // Message no. assigned by server
    S7_a_type:='alarm_8p'             // Block reports with ALARM_8P
       }           :DWORD := 0;       // Message number

                                      // Parameters for SIMATIC BATCH
  STEP_NO {S7_visible := 'false';
      S7_m_c   := 'true'}  :DWORD;    // Batch step number
  BA_ID {S7_visible  := 'false';
     S7_m_c    := 'true'}  :DWORD;    // Consecutive batch number
  BA_EN {S7_visible := 'false';       // Parameter hidden in CFC chart
     S7_m_c := 'true'                 // Parameter supports O&M
     }              :BOOL := 0;       // Batch busy enable
  BA_NA {S7_visible := 'false';
     S7_m_c   := 'true'} :STRING[32] := '';  // Batch name

  OCCUPIED {S7_visible := 'false';
       S7_m_c   := 'true'} :BOOL := 0;        // Batch busy ID

  RUNUPCYC   {S7_visible:='false';
      S7_link:='false'} :INT := 3;     // Number of initial startup cycles
  SUPPTIME       :REAL := 0;          // Delay time
  SUPP_IN        :REAL := 0;         // Input value for delay time
END_VAR

VAR_OUTPUT
  LMN {S7_shortcut:='pressure';        // Name of the parameter on OS
    S7_unit := '%';                 // Unit of the parameter
    S7_m_c := 'true'                // monitoring supported
    } :REAL;                        // Manipulated value output

  QH_ALM  :BOOL := false;           // 1 = high limit alarm triggered
  QL_ALM  :BOOL := false;          // 1 = low limit alarm triggered

  QSP_HLM   {S7_visible:='false';
    S7_dynamic:='true'} :   BOOL := 0;   // 1= Setpoint output high limit
                                         // is active
  QSP_LLM   {S7_visible:='false';
    S7_dynamic:='true'} :   BOOL := 0; // 1=Setpoint output low limit
                                         // is active
  Q_SP_OP   {S7_visible:='false';
    S7_dynamic:='true';
    S7_m_c:='true'} :   BOOL := 0;  // Status: 1 = Setpoint input enabled

  QOP_ERR   {S7_visible:='false';
    S7_dynamic:='true'} :   BOOL := 0;   // 1 = operator error

  QMSG_ERR   {S7_visible:='false';
    S7_dynamic:='true'} :   BOOL := 0;   // ALARM_8P: Message error

  MSG_STAT   {S7_visible:='false';
    S7_dynamic:='true'} :   WORD := 0;   // Message error information

  MSG_ACK   {S7_visible:='false';
    S7_dynamic:='true'} :   WORD := 0;   // Acknowledge messages

  SUPP_OUT                :REAL := 0;    // Output value for delay
  SP   {S7_dynamic:='true';
    S7_m_c:='true'} :    REAL := 0;      // Active setpoint

END_VAR
VAR_IN_OUT
 SP_OP {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_shortcut:='Setpoint';
    S7_unit:='%'} :   REAL := 0;           // Input of setpoint

 // user-specific associated message values of ALARM_8P

  AUX_PR05 {S7_visible := 'false'} : ANY;  // Associated value 5
  AUX_PR06 {S7_visible := 'false'} : ANY;  // Associated value 6
  AUX_PR07 {S7_visible := 'false'} : ANY;  // Associated value 7
  AUX_PR08 {S7_visible := 'false'} : ANY;  // Associated value 8
  AUX_PR09 {S7_visible := 'false'} : ANY;  // Associated value 9
  AUX_PR10 {S7_visible := 'false'} : ANY;  // Associated value 10
```

```
END_VAR
```

1.2.4.2 Local variables

Additional variables which are not output as block parameters to external functions must be declared as local variables.

There are two types of local variables:

- Static variables
- Temporary variables

Static variables

By contrast to temporary variables, the static variables retain their values across several block calls. The value only changes when you edit it in the block algorithm.

These variables are of particular importance in PCS 7-compliant blocks if you want to call either your own or default blocks within your block. In this case you should implement a **multiple instance block**. This can be done by declaring an instance of the called block within the static variable.

The called blocks must exist in the block folder of the S7 program in order to successfully compile the calling block.

If you want to visualize and interconnect parameters of the called block, you must copy these from your block algorithm or into parameters of your block. The parameters of the called block itself are not visible to external functions.

Multiple instances

You will find examples of multiple instance applications in the chapter dealing with CFC block types and in the relevant SCL code of the sample project.

Note

Called SFBs and SFCs, such as SFC 6 (RD_SINFO) or SFB 0 (CTU) are found automatically in the standard library and are written to your S7 program when you compile the calling block.

If the called FBs and the calling block are available in the same library, the program copies the called FBs to the block folder when you install the calling block in a CFC chart. You will otherwise have to copy the blocks manually.

Temporary variables

Temporary variables are valid only for the duration of **one** block call, i.e., they must be calculated at each new block call.

There are no special features to observe for PCS 7-compliant blocks in this context.

Extract from the block template:

```
//*****************************************************************************
// Declaration section: Temporary variables
//*****************************************************************************

VAR_TEMP
  // Start info: Structure with info for the OB that has just called
  // the block
  TOP_SI:    STRUCT
   EV_CLASS :BYTE;
   EV_NUM   :BYTE;
   PRIORITY :BYTE;
   NUM      :BYTE;
   TYP2_3   :BYTE;
   TYP1     :BYTE;
   ZI1      :WORD;
   ZI2_3    :DWORD;
  END_STRUCT;

// Start info: Structure with info for the most recently called startup OB
  START_UP_SI:  STRUCT
   EV_CLASS :BYTE;
   EV_NUM   :BYTE;
   PRIORITY :BYTE;
   NUM      :BYTE;
   TYP2_3   :BYTE;
   TYP1     :BYTE;
   ZI1      :WORD;
   ZI2_3    :DWORD;
  END_STRUCT;

  S7DT   :DATE_AND_TIME;          // Local time variable
  DUMMY  :INT;                    // Associated variable
END_VAR
```

1.2.5 Code section

The code section contains the actual block algorithm. This allows you to implement the following features for PCS 7-compliant blocks:

- The technological functions of the block
- Block properties which can be used, for example, to report asynchronous events and the block states to the OS, and to visualize these using a faceplate of a WinCC message list

1.3 Initialization

Implementing an initialization sequence

It is usually required to initialize various parameters at the initial call of your block. The block may also contain additional tasks it only has to execute once, depending on the technological function of your block. If this is the case in your block you must implement an initial startup sequence.

This is done by defining a BOOLEAN variable, for example sbRESTART, which can be implemented as static variable.

Your block is not only initialized when you restart the system, but also when you reload it while the CPU is in RUN. It is for this reason that you have to integrate the initial startup sequence in the cyclic section of your block. You may therefore, if necessary, distribute the initial startup sequence to several call cycles of the block.

```
//*****************************************************************************
// Dependency on the calling OB
//*****************************************************************************

// Reading the start info by calling SFC6 (RD_SINFO)
  DUMMY := RD_SINFO (TOP_SI := TOP_SI, START_UP_SI := START_UP_SI);

  IF sbRESTART THEN
  // Initialization sequence
  TOP_SI.NUM := 100;     // Execution of the initialization sequence as restart
  sbRESTART := FALSE;    // Reset initialization sequence
  END_IF;
// Which OB called the block?

 CASE WORD_TO_INT(BYTE_TO_WORD(TOP_SI.NUM)) OF

//*****************************************************************************
// Handling of error OBs
//*****************************************************************************

    // OB80: Timeout error
    80:
    QH_ALM  := 0;           // Reset error outputs
    QL_ALM  := 0;

//*****************************************************************************
// Startup
//*****************************************************************************

    // OB100: Restart
    100:
    QH_ALM  := 0;           // Reset error outputs
    QL_ALM  := 0;
    siRUNUPCNT := RUNUPCYC;  // Save RUNUPCYC value
 ELSE
....
```

1.4 Time dependency

Programming a time dependency

Define an input parameter of data type REAL, for example SAMPLE_T, if the conditions shown below apply to your block:

- It is processed within a constant time-out level
- The block has to evaluate the length of the time interval in order to execute time-sensitive tasks, for example, for controller blocks

The length of the time interval can be declared at this input parameter.

Program this parameter to synchronize it with the watchdog interrupt OB in which your block is called. This ensures that your block algorithm is always executed within the correct time.

The CFC automatically sets a parameter value matching the calling OB if you set system attribute "S7_sampletime" = 'true' at the parameter. The program also makes allowances for any reduction of the ratio. Assign the "S7_visible" and "S7_link" system attributes to the parameter as well and set their status to 'false'. This setting hides the parameter in the CFC and prevents its interconnection in order to avoid unintentional manipulation of its value by the user.

However, the CFC can only automatically assign values to this parameter if the "Update sampling time" check box is set when you compile the program.

Implementing the time dependency

The next extract of the block template shows you how to implement such a time dependency. You can program a waiting time at the block by setting the SUPPTIME parameter. Changes at input SUPP_IN are transferred to output SUPP_OUT on expiration of this waiting time.

```
//*****************************************************************************
// Declaration section: Block parameters
//*****************************************************************************
VAR_INPUT

  SAMPLE_T {S7_sampletime:= 'true' // Parameter block scan cycle
                                   // (Task cycle)
       S7_visible:='false';            // Parameter is hidden
       S7_link:= 'false'           // Parameter cannot be not interconnected
      }        :REAL := 1;    // Delay time [s] (default = 1 s)
....
END_VAR

//*****************************************************************************
// Declaration section: Static variables
//*****************************************************************************
VAR
....
  sSUPP_IN    :REAL := 0;          // Old value of sample delay input
  ACT_TIME    :REAL := 0;          // Time counter
....
END_VAR

VAR_OUTPUT
....
SUPP_OUT               :REAL := 0;    // Output value for delay
....
END_VAR

//*****************************************************************************
// Technological section
//*****************************************************************************

  IF (SUPP_IN <> sSUPP_IN) THEN
   ACT_TIME := SUPPTIME;          // Initialize time counter
   sSUPP_IN := SUPP_IN;
  END_IF;

  IF (ACT_TIME > 0) THEN           // If waiting time has not yet expired
   ACT_TIME := ACT_TIME-SAMPLE_T;  // count down waiting time
  ELSE
   SUPP_OUT := SUPP_IN;            // Transfer input value to output
  END_IF;
....
```

1.5 Handling asynchronous startup and error OBs

Asynchronous event

The AS calls an asynchronous OB when asynchronous events such as restart, removal/insertion and rack failure are detected. If your block has to react to such events, install it in the corresponding OB and program the block algorithm for detection of these events.

Installation in asynchronous OBs

Use system attribute "S7_tasklist" to install your block in specific OBs. Enter all OB values required. Example: S7_tasklist: = 'OB80,OB100'. The CFC installs the block in the current watchdog interrupt OB and in all OBs defined at "S7_tasklist" when you insert the block into a CFC chart.

Checking the calling OB

Call SFC6 (RD_SINFO) in the block algorithm in order to determine which OB is currently executing your block. The algorithm reads the start info of your block and returns information about the currently active OB (Parameter TOP_SI) and about the most recently called startup OB (parameter START_UP_SI).

Both parameters represent identical structures which you must define in your temporary variables. Meaning of the structure elements in particular:

Table 1-3: Parameters TOP_SI and START_UP_SI

Structure element	Data type	Meaning
EV_CLASS	BYTE	Bits 0 to 3: Event ID Bits 4 to 7: Event class
EV_NUM	BYTE	Event number
PRIORITY	BYTE	Number of the run level
NUM	BYTE	Number of the calling OB
TYP2_3	BYTE	Data ID of ZI2_3
TYP1	BYTE	Data ID of ZI1
ZI1	WORD	Additional info 1
ZI2_3	DWORD	Additional info 2_3

The content of the structure elements correspond with the temporary variables of the calling OB. The names and data types of these elements may differ depending on the OB. You therefore have to interconnect and appropriately evaluate the various structure elements based on the corresponding OB description (cf. *STEP 7 - System and Standard Functions* manual). The table below and extract from the block template show this based on the example of OB 80 (timeout error).

Table 1-4: Assignment of the elements of the TOP_SI start info to the temporary variables of OB 80

TOP_SI/STARTUP_SI		OB 80	
Structure element	**Data type**	**Temporary variable**	**Data type**
EV_CLASS	BYTE	OB80_EV_CLASS	BYTE
EV_NUM	BYTE	OB80_FLT_ID	BYTE
PRIORITY	BYTE	OB80_PRIORITY	BYTE
NUM	BYTE	OB80_OB_NUMBR	BYTE
TYP2_3	BYTE	OB80_RESERVED_1	BYTE
TYP1	BYTE	OB80_RESERVED_2	BYTE
ZI1	WORD	OB80_ERROR_INFO	WORD
ZI2_3	DWORD	OB80_ERR_EV_CLASS	BYTE
		OB80_ERR_EV_NUM	BYTE
		OB80_OB_PRIORITY	BYTE
		OB80_OB_NUM	BYTE

Note

In its temporary variables, each OB contains the date and time of the call. However, these are not included in the startup information read with SFC6.

PCS 7-compliant blocks are not installed in the hot restart OB 101 or cold start OB 102.

The next extract from the block template shows how the OBs are handled.

```
//*****************************************************************************
// Code section
//*****************************************************************************

 CASE WORD_TO_INT(BYTE_TO_WORD(TOP_SI.NUM)) OF

//*****************************************************************************
// Handling of error OBs
//*****************************************************************************

    // OB 80: Timeout error
    80:
    QH_ALM  := 0;           // Reset error outputs
    QL_ALM  := 0;

//*****************************************************************************
// Startup
//*****************************************************************************

    // OB100: Restart
    100:
    QH_ALM  := 0;           // Reset error outputs
    QL_ALM  := 0;
    siRUNUPCNT := RUNUPCYC;  // Save RUNUPCYC value
 ELSE
```

1.6 Operating, monitoring and reporting

Operating and monitoring

A block must be interconnected with the OS in order to be able to **operate** and **monitor** its parameters at the OS. This concerns both the required parameters and the actual block.

Operator control functions

If you want to manipulate a parameter value only at the OS you need to install an in/out or input parameter with system attribute "S7_m_c" for this manipulated value.

If, on the other hand, you need an option of either fetching a parameter value from another block or setting the value at the OS and change over from the interconnected to the manipulated value in a bumpless operation, you require altogether three parameters:

- One input parameter for toggling between manipulated and interconnected values
- One input parameter for the interconnected value
- One in/out parameter with system attribute "S7_m_c" for the manipulated value This must be an in/out parameter, because the block algorithm has to write back the interconnected value to the manipulated value as long as the interconnected value is selected in order to obtain a bumpless changeover.

Use the control blocks of the "PCS 7 Library V70" and their corresponding control method for all operator control functions on the OS. This integrates all interlocks, including the optional bumpless changeover between the manipulated and interconnected value required, for example, for toggling the manual/auto modes. You can install these control blocks in your block using the multiple instance technique.

Blocks for limiting input operations

PCS 7 provides the following block for limiting input operations:

- OP_A_LIM (**op**eration **a**nalog **lim**ited)
- OP_A_RJC: Rejects the input operation if limits are violated
- OP_A Use this block if you decide to discard limit monitoring

---

Note

The AS block and the faceplate interact in asynchronous mode, i.e. a value input at the faceplate is written to the instance DB of the AS block and evaluated by this AS block at a later time. As the relevant limits may already have changed at this point in time, the manipulated value should be checked for errors both on the AS and on the OS.

Blocks for binary input

The PCS 7 Library V61 provides the OP_D (FB 48), OP_D3 (FB 49) and OP_TRIG (FB 50) blocks for binary input. For further information, refer to the Online Help.

Input definition

The extract below shows an input definition:

```
//*****************************************************************************
// Input of the setpoint SP_OP (REAL value) or of the interconnected
// setpoint SP_EXT
//*****************************************************************************

// Multiple instance call OP_A_LIM (for information on the meaning of the
   // parameters, refer to the Online Help OP_A_LIM)

    OP_A_LIM_1(U := SP_OP, U_HL:= SP_HLM, U_LL:= SP_LLM, OP_EN:= SP_OP_ON,
    BTRACK:= SPBUMPON, LINK_ON:= SP_EXTON, LINK_U:= SP_EXT);

    OK := OK AND ENO; //Accept Enable Out of OP_A_LIM in OK flag of the block
                      //
    Q_SP_OP := OP_A_LIM_1.QOP_EN;  // 1: Enable SP input

    QOP_ERR := OP_A_LIM_1.QOP_ERR; // 1: Input error
    QSP_HLM := OP_A_LIM_1.QVHL;    // 1: High limit
    QSP_LLM := OP_A_LIM_1.QVLL;    // 1: Low limit
    SP   := OP_A_LIM_1.V;          // effective setpoint
```

Messages

You can define a multiple instance of an alarm block in the static variables to enable the output of messages and/or events to the OS at your block. The message and acknowledgment reactions, including the transfer of associated values, are determined by the properties of the CPU (selectable acknowledgment-triggered reporting) and of the integrated alarm block.

The "Standard Library" contains alarm block templates in the form of SFBs.
Blocks included, for example:

ALARM	SFB 33	Monitors a signal with 1 to 10 associated values **with** confirmation prompt
ALARM_8	SFB 34	Monitors up to 8 signals
ALARM_8P	SFB 35	Monitors up to 8 signals with 1 to 10 associated values
NOTIFY	SFB 36	Monitors a signal with 1 to 10 associated values **without** confirmation prompt
NOTIFY_8P	SFB 31	Monitors up to 8 signals with 1 to 10 associated values **without** confirmation prompt

Block header entries

In order to enable manipulation and/or monitoring of the block on the OS, set system attribute "S7_m_c" = 'true' at the block header in the list of system attributes.

Set attribute S7_alarm_ui := '1' at the block header in order to enable the call of the PCS 78 message dialog in SIMATIC Manager. The value '0' returns the STEP 7-compliant dialog.

Entries in the declaration section

In order to enable manipulation and monitoring of your block parameters on the OS, set system attribute "S7_m_c" = 'true' at each block parameter you want to control and monitor.

You enable the output of messages and/or events to the OS at your block by defining an input of the data type DWORD (here: EV_ID). In the instance DB, this input accepts the message number automatically assigned by the system (message server).

The message number must be unique throughout the S7 project in order to avoid conflicts in projects containing several AS and OS. The numbers for individual messages required in WinCC are derived from this message number during data transfer (compile OS).

At this input, enter system attribute "S7_server" with the value 'alarm_archiv' and system attribute "S7_a_type" with the value 'alarm_8p', or a value according to the message block you installed.
The input should not be visible in the CFC chart and it should not be possible to interconnect or assign parameters to the input in order to avoid any unintentional manipulation of data assigned by the system.

Using system attributes in the block header and for input EV_ID

The extract of the block template below shows applications for system attributes in the **block header** and for **input** EV_ID which is to receive the message number.

```
//*****************************************************************************
// Block header
//*****************************************************************************

FUNCTION_BLOCK    "CONTROL"
TITLE =                              'CONTROL'

{  // List of system attributes
S7_tasklist:=     'OB80,OB100'; // Block call upon timeout error or restart
S7_m_c:= 'true';              // Block can be controlled and monitored
S7_alarm_ui:=     '1'     // Settings PCS7 message dialog ('0' = default dialog
}
AUTHOR:                             ABC
NAME:                                 CONTROL
VERSION:                            '0.02'
FAMILY:                             XYZ
KNOW_HOW_PROTECT

//*****************************************************************************
// Declaration section: Block parameters
//*****************************************************************************

VAR_INPUT
....                                 // Parameter EVENT ID for message number
  EV_ID   {S7_visible:='false';      // Parameter hidden in CFC
    S7_link:='false';              // Parameter cannot be interconnected in CFC
    S7_param :='false';               // Parameter cannot be programmed in CFC
    S7_server:='alarm_archiv';        // Message no. assigned by server
    S7_a_type:='alarm_8p'             // Block reports with ALARM_8P
       }           :DWORD := 0;       // Message number
...
END_VAR
```

Additional message options

You can assign all ALARM block inputs which are not required by the block to the block interface in order to provide additional message options to the user. You can enable or disable these messages by defining additional inputs and creating logical links in the block algorithm (see 1.6.2.). These messages are handled otherwise without taking further provisions and can only be disabled by the message system of the OS. This also applies to the unused associated values. You can then use these in the messages as described in section 1.7.

Definition of ALARM_8P

The example below shows the definition of ALARM_8P:

```
//****************************************************************************
// Declaration section: Block parameters
//****************************************************************************
                  // user-specific associated values of messages from ALARM_8P
  AUX_PR05 {S7_visible := 'false'} : ANY;  // Associated value 5
  AUX_PR06 {S7_visible := 'false'} : ANY;  // Associated value 6
  AUX_PR07 {S7_visible := 'false'} : ANY;  // Associated value 7
  AUX_PR08 {S7_visible := 'false'} : ANY;  // Associated value 8
  AUX_PR09 {S7_visible := 'false'} : ANY;  // Associated value 9
  AUX_PR10 {S7_visible := 'false'} : ANY;  // Associated value 10
....
//****************************************************************************
// Declaration section: Static variables
//****************************************************************************
....
//****************************************************************************
// Declaration section multiple instances
//****************************************************************************
  OP_A_LIM_1:  OP_A_LIM;        // Control block 1
  ALARM_8P_1:  ALARM_8P;   // Generation of max. 8 messages with max.
                           // 10 associated values
//****************************************************************************
// Reporting with ALARM_8P
//****************************************************************************
   // STRING variables may not be interconnected as associated values with
   // ALARM8_P and are therefore transferred in array of bytes
    FOR DUMMY := 1 TO 16
    DO
      sbyBA_NA[DUMMY] := 0;    //delete array as default
    END_FOR;

    DUMMY := BLKMOV (SRCBLK:= BA_NA,DSTBLK:=sbyBA_NA);
    swSTEP_NO  := STEP_NO;     // Batch step number
                               //(due to I/O associated value ALARM_8P)
    sdBA_ID   := BA_ID;    // Batch ID (due to I/O associated value ALARM_8P)
    srPV_IN   := PV_IN;    // Associated value may not be an input
 ALARM_8P_1(EN_R := TRUE,      // Update of output ACK_STATE
      ID := 16#EEEE,           // Data channel for messages (always 16#EEEE)
      EV_ID:= EV_ID,           // Message number > 0
      SIG_1:= NOT M_SUP_AH AND QH_ALM,  // monitored Signal 1 -> Message high
                                        // limit alarm
      SIG_2:= NOT M_SUP_AL AND QL_ALM,  // monitored Signal 2 -> Message low
                                        // limit alarm
      SIG_3:= 0,                 // monitored Signal 3 -> no message
      SIG_4:= 0,                 // monitored Signal 4
      SIG_5:= 0,                 // monitored Signal 5
      SIG_6:= 0,                 // monitored Signal 6
      SIG_7:= 0,                 // monitored Signal 7
      SIG_8:= 0,                 // monitored Signal 8
      SD_1 := sbyBA_NA,         // Associated value 1
      SD_2 := swSTEP_NO,        // Associated value 2
      SD_3 := sdBA_ID,          // Associated value 3
      SD_4 := srPV_IN,          // Associated value 4
      SD_5 := AUX_PR05,         // Associated value 5
      SD_6 := AUX_PR06,         // Associated value 6
      SD_7 := AUX_PR07,         // Associated value 7
      SD_8 := AUX_PR08,         // Associated value 8
      SD_9 := AUX_PR09,         // Associated value 9
      SD_10:= AUX_PR10);        // Associated value 10
    QMSG_ERR := ALARM_8P_1.ERROR;     // ERROR status parameter
    MSG_STAT := ALARM_8P_1.STATUS;        // STATUS parameter
    MSG_ACK := ALARM_8P_1.ACK_STATE;  // Actual OS acknowledgment status
....
```

1.6.1 Message suppression at startup

Procedure

In order to reduce load on the AS during startup as a result of simultaneous generation of several messages at different blocks you should define an input parameter RUNUPCYC of the data type INT. At this parameter you can declare the number of startup cycles during which messages should be suppressed. In the block algorithm, you then count the number of calls and only enable the generation of messages if the programmed number of cycles has been completed. The extract from the block template below shows this procedure.

Example

```
//*****************************************************************************
// Declaration section: Block parameters
//*****************************************************************************
VAR_INPUT
...
  H_ALM {S7_m_c := 'true';             // Parameter supports O&M
     S7_visible:='false';            // Parameter is hidden
     S7_link := 'false'           // and cannot be interconnected
     }  :REAL := 100;                    // high limit alarm (default = 100)

  L_ALM {S7_m_c := 'true';          // Parameter supports O&M
     S7_visible:='false';            // Parameter is hidden
     S7_link := 'false'           // and cannot be interconnected
     }  :REAL := 0;                      // high limit alarm (default = 0)
...
  RUNUPCYC   {S7_visible:='false';
      S7_link:='false'} :INT := 3;     // Number of initial startup cycles
END_VAR
//*****************************************************************************
// Declaration section: Static variables
//*****************************************************************************
VAR
...
siRUNUPCNT  :INT := 0;           // Counter for RUNUPCYC execution
...
END_VAR
//*****************************************************************************
// Startup
//*****************************************************************************
    // OB100: Restart
    100:
...
    siRUNUPCNT := RUNUPCYC;  // Save RUNUPCYC value
...
```

```
//***************************************************************************
// Technological section
//***************************************************************************
  IF siRUNUPCNT = 0            // RUNUPCYC cycle already completed?
  THEN
   IF (PV_IN > H_ALM) THEN   // If the process value violates alarm high limits
     QH_ALM  := 1;             // set error output
     QL_ALM  := 0;             // reset error output

   ELSIF (PV_IN < L_ALM) THEN // If the process value violates the alarm low
                                 // limit
     QL_ALM  := 1;            // Set error output,
     QH_ALM  := 0;            // Reset error output
   ELSE
     QH_ALM  := 0;            // Reset error outputs
     QL_ALM  := 0;

   END_IF;
  ELSE
   siRUNUPCNT := siRUNUPCNT - 1;
  END_IF;
 END_CASE;
```

1.6.2 Suppressing specific messages

Procedure

To suppress specific messages, for example, messages to be expected:

Define a BOOLEAN input parameter at your block and evaluate it in the block algorithm in order to prevent an event from being passed to the SIG input of the ALARM block when message suppression is active.

Inputs M_SUP_AL and M_SUL_AH are used in the example below to suppress a single alarm.

Example

```
//*****************************************************************************
// Declaration section: Block parameters
//*****************************************************************************

VAR_INPUT
.....
                      // Suppress ALARM LOW
  M_SUP_AL {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_string_0:= 'Suppress LL=No';  // Operator text for value (M_SUP_AL) = 0
    S7_string_1:= 'Suppress LL=Yes'  // Operator text for value (M_SUP_AL) = 1
      }           :BOOL;        // Suppression of actual value low limit alarm

                      // Suppress ALARM HIGH
  M_SUP_AH {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_string_0:= 'Suppress HH=No';    // Operator text for value (M_SUP_AH)= 0
    S7_string_1:= 'Suppress HH=Yes'    // Operator text for value (M_SUP_AH)= 1
      }           :BOOL;         // Suppression of actual value low limit alarm
END_VAR

//*****************************************************************************
// Reporting with ALARM_8P
//*****************************************************************************
.....
 ALARM_8P_1(EN_R := TRUE,        // Update output ACK_STATE
      ID := 16#EEEE,             // Data channel for messages (always 16#EEEE)
      EV_ID:= EV_ID,             // Message number > 0
      SIG_1:= NOT M_SUP_AH AND QH_ALM,  // monitored Signal 1 -> Message
                                        // high limit alarm
      SIG_2:= NOT M_SUP_AL AND QL_ALM,  // monitored Signal 2 -> Message
                                        // low limit alarm
      SIG_3:= 0,                        // monitored Signal 3 -> no message
      SIG_4:= 0,                        // monitored signal 4
.....
.....
```

1.6.3 Compiling the source code

When you have completed programming, compile the source code using the SCL Compiler. Select **File > Compile**. You can also click the corresponding toolbar icon.

FB 501 is available in the block folder of the S7 program after you successfully completed compilation.

For further information, refer to the "*S7-SCL for S7-300 and S7-400*" manual.

1.7 Configuring messages

General information

You enable message output to the OS at the block by defining the multiple instance of an alarm block in the static variables.

The ALARM_8/ALARM_8P block can be used to monitor up to eight signals you declare as alarm block parameter. The block logs the actual signal states at each call and outputs a message to the OS to report any change to one of the signals.

Configuring messages in SIMATIC Manager

You can edit parameter EV_ID for the selected block in the "PCS 7 message configuration" dialog box of SIMATIC Manager. Select **Edit > Special object properties > Messages...**.

You can disable certain elements such as the message text or class in order to prevent any changes to these at other locations. This feature allows you to prevent any change of this message at the block instance when you install the block in a CFC chart, for example.

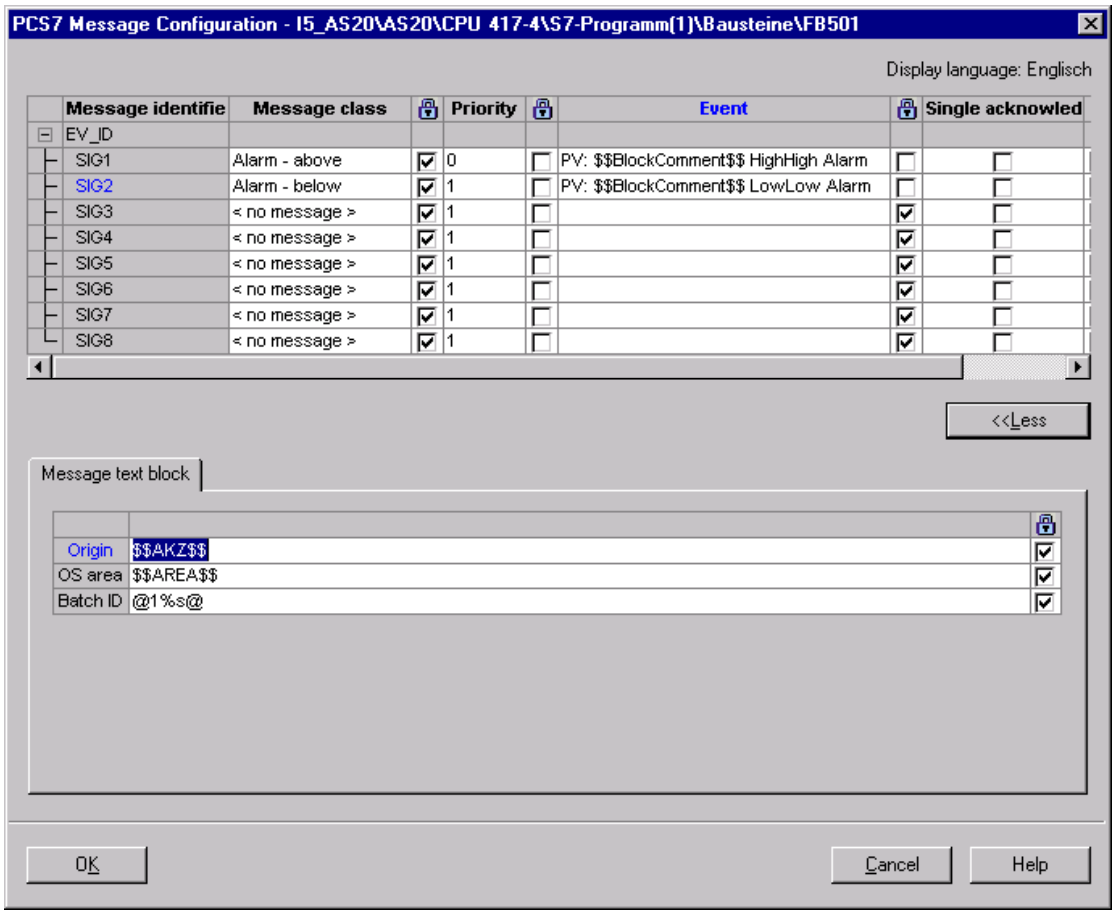


Fig. 1-7::Message configuration in SIMATIC Manager

Start by entering the global message texts for this block. The individual texts correspond to the user text blocks in AlarmLogging of WinCC.

Origin

Define the message origin at this parameter.

If you enter the origin keyword $$AKZ$$ the program initiates the following actions when you transfer the data:

When you compile the OS, the program determines the path of the hierarchy folder, the chart name and the block name, and saves these to the OS message texts.

Note

The TH path is only entered if the name is derived from the relevant hierarchy folders (properties of the THF or TH settings).

OS area

Define the message area at this parameter.

If you enter the area keyword $$AREA$$ or leave a blank input box, the program initiates the following actions when you transfer the data:

When you compile the OS, the program evaluates the corresponding attribute of the hierarchy folder and saves it to the OS message texts.

Batch ID

You can define a batch ID for the message at this parameter.

If you enter the batch ID the program initiates the following actions when you transfer the data:

It evaluates the corresponding attribute and writes it to the "Charge name" column of the WinCC message list when you compile the OS. However, instead of the batch ID, this entry represents the batch name.

Enter the value @1%s@ if your block is to be compatible with the optional S7 package SIMATIC BATCH. This function assigns the BATCH charge identifier as initial associated value to the message (cf. chapter 1.8).

If you do not use SIMATIC BATCH, do not make any entry here.

Message classes

Define the corresponding message classes in the next step. Click in a corresponding message row in the "Message class" column to transform this into a combo box in which you can select the message class. Assign all unused messages the "< no message >" class. For detailed information on handling messages, refer to the WinCC documentation.

Settings to be made:

- Enter a description of the error cause in the "Event" column The text length should not exceed 40 characters, including any associated values
- Define these functions in the "Single acknowledgment" column:
  - Set the check box to activate separate acknowledgment of messages
  - Reset the check box to enable group acknowledgment for the message
- Define these properties at the "Locked" (blue lock icon) column:
  - Deactivate the check box in order to allow instance-specific modification of the message class in the CFC by the block users
  - Activate the check box in order to prevent changes to the message class

Priority

You can assign different message priorities in this dialog.

Properties you can define at the "Locked" (blue lock icon) column:

- Deactivate the check box in order to allow instance-specific modification of the priority class in the CFC by the block users
- Activate the check box in order to prevent changes to the priority class

Event

Enter a message text in this input box.

Associated values for messages

In order to include additional information such as measured values in the message frame output to the OS, integrate an ALARM message block which supports the definition of associated values (ALARM_8P = 10 associated values). The values transferred at the SD_1 to SD_10 parameters of the ALARM block can be included in the message texts in the following format:

@ Parameter number format instruction @

In the next example, the value defined at parameter SD_4 is output in decimal format. The supported format instructions correspond with the C syntax.

@4%d@

You can include the block instance comment in the message text by entering the keyword $$BlockComment$$.

At the "Locked" column (blue lock icon), you define whether to allow (check box deactivated) or lock (check box activated) instance-specific modification of the message text in the CFC by the user of the block.

Note

The associated values of an ALARM_8P are of data type ANY, connection type I/O. The data types supported for associated values are listed in the ALARM_8P Online Help. If you define the associated values as an input and not as an I/O in the block interface, you have to save the associated values to a variable in the VAR section and transfer this variable as an associated value with ALARM_8P.

The data type STRING may not be transferred as an associated value. You have to implement it as in the block template, by copying it to an ARRAY OF BYTE and transferring this ARRAY as an associated value.

Single acknowledgment

Activate the check box if the message is to be acknowledged separately.

Info text

Enter an info text in this field.

1.8 Integration of SIMATIC BATCH

Definition of input and in/out parameters

Input or in/out parameters to be defined when using your blocks with the optional S7 package "SIMATIC BATCH":

Parameter name	Meaning	Parameter type	Data type
BA_EN	BATCH busy enable	INPUT	BOOL
BA_NA	BATCH name	INPUT	STRING[32]
BA_ID	Consecutive batch number	INPUT	DWORD
OCCUPIED	BATCH busy ID	INPUT	BOOL
STEP_NO	BATCH step number	INPUT	DWORD

Extract from the block template:

```
//*****************************************************************************
// Declaration section: Block parameters
//*****************************************************************************
VAR_INPUT
....
                  // Parameters for SIMATIC BATCH
  STEP_NO {S7_visible := 'false';
      S7_m_c   := 'true'}  :DWORD;    // Batch step number
  BA_ID {S7_visible  := 'false';
     S7_m_c    := 'true'}  :DWORD;    // Consecutive batch number
  BA_EN {S7_visible := 'false';       // Parameter hidden in CFC chart
     S7_m_c := 'true'                 // Parameter supports O&M
     }             :BOOL := 0;        // Batch busy enable
  BA_NA {S7_visible := 'false';
     S7_m_c   := 'true'} :STRING[32] := '';  // Batch name

  OCCUPIED {S7_visible := 'false';
       S7_m_c   := 'true'} :BOOL := 0;        // Batch busy ID
....
END_VAR
```

Generating messages

In order to generate messages in a block of this type you need to implement inputs BA_NA, STEP_NO and BA_ID as associated message values in the given order.

The associated values are used as shown below:

Associated value	Meaning
1	BATCH name BA_NA
2	BATCH step number STEP_NO
3	BATCH: consecutive batch number BA_ID
4 to 7	Block-specific assignment or user-specific

1.9 Creating CFC block types

1.9.1 CFC

By contrast to CFC which is based on the interconnection of graphical objects, SCL involves the declaration of variables and programming of assignments. CFC supports the development of new blocks by means of the insertion and interconnection of existing blocks.

The overview in the next section is focused on functions and basic procedures. For details on the creation of block in CFC, refer to the *CFC for S7* manual and to the CFC Online Help system.

1.9.2 Example: CONTROL2

Task

The "CONTROL" block template is to be expanded by integrating a multiplier. The product of the multiplication of the input values "IN1" and "IN2" forms the actual value. The expanded block is to be generated as CONTROL2 (FB 601).

Procedure

1. Open a new CFC chart and then insert the "CONTROL" block template
2. Drag-and-drop a **MUL_R** (FC 63) multiplier from the CFC Library\ELEMENTA to the chart
3. Interconnect output "OUT" of **MUL_R** with the process value (parameter "PV_IN") of the block template
4. Select the **View > Chart connectors** command in the chart
   The interface editor opens

   You can also click this toolbar icon:  .
5. Select the "IN" symbol on the left pane of the "Chart connectors" window
6. Interconnect "IN1" and "IN2" of **MUL_R** with the chart connectors Drag-and-drop the block connector to the chart connector in the pane on the right side
7. Select the **Object properties > Tab: Connectors > Column: Hidden > Reset set connections** to show all connections at the CONTROL block, with the exception of EN and ENO which were previously hidden
8. Interconnect all visible connectors, with the exception of the already interconnected actual value, with the chart connectors of the CFC chart

9. Settings required to compile the CFC chart as block:
   - Select the **Chart > Compile > Chart as block type** command.
     A dialog box opens
   - On the "General" tab, enter FB number 601. Next, configure the other properties in the corresponding fields: Symbolic name, family, author, version The name of the CFC chart is already entered in the "Name" field (header) field
   - Define the block and system attributes in the "Attributes" tab as required You do not have to define system attribute "S7_tasklist" on this tab (see the installation rule below).
   - Click "OK"
     Compilation is now started

Installation rule

OBs in which the CFC block type is installed:

- Cyclic OB (OB35, for example) to be used as default setting
- Each OB listed in a task list of a sublevel block, that is, the block's task list represents the cumulative task list of all sublevel blocks The actual sublevel blocks are only called in OBs which contain these blocks in their internal task list Significance in terms of this example:
  - The **CONTROL** block template is assigned the task list "S7_tasklist = 'OB80,OB100' "
  - Multiplier **MUL_R** does not have a task list
  - The CFC block type therefore has the task list "S7_tasklist = 'OB80,OB100' " However, OB80 and OB100 only call **CONTROL**, without calling **MUL_R**.

In order to prevent the CONTROL block from being called in OB35, you should either delete it from OB35 or move it to a different OB. The same applies to the MUL_R block.

1.10 Naming conventions and range of numbers

Range of numbers

In order to prevent numbering conflicts with the PCS 7 process control blocks of Siemens, you should number the blocks starting at number 501. You should also make allowances for performance data of the CPU types supported by your library when you define the block numbers.

Names

Rule for naming block parameters:

Binary outputs start with **Q**. Examples: QH_ALM, Q_L_ALM.

1.11 Source code of the example

```
//Creator: ABC Date: 13.08.00               Vers.:1.00
//Changed:            Date: 18.11.03        Vers.:

//***************************************************************************
// Block header
//***************************************************************************

FUNCTION_BLOCK "CONTROL"
TITLE =    'CONTROL'
{  // List of system attributes
S7_tasklist:= 'OB80,OB100';//The block is called upon timeout error or restart
S7_m_c:= 'true';       // Block can be controlled and monitored
S7_alarm_ui:= '1'  // PCS7 message dialog setting('0'= default message dialog)
}
AUTHOR:           ABC
NAME:             CONTROL
VERSION:         '0.02'
FAMILY:           XYZ
KNOW_HOW_PROTECT

//***************************************************************************
// Declaration section: Block parameters
//***************************************************************************

VAR_INPUT
SAMPLE_T {S7_sampletime:= 'true';  // Param. of the block sampling time
                                      // (task cycle)
       S7_visible:='false';        // Parameter is hidden
       S7_link:= 'false'           // Parameter cannot be not interconnected
      }          :REAL := 1;       // Delay [s] (default = 1 s)

  H_ALM {S7_m_c := 'true';
     S7_visible:='false';
     S7_link := 'false'}  :REAL :=100;  // high limit alarm
                                        // (default = 100)
  L_ALM {S7_m_c := 'true';         // Parameter supports O&M
     S7_visible:='false';           // Parameter is hidden
     S7_link := 'false'           // and cannot be interconnected
     }           :REAL := 0;       // low limit alarm (default = 0)

  M_SUP_AL {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_string_0:= 'Suppress LL=No'; // Operator text for value (M_SUP_AL) = 0
    S7_string_1:= 'Suppress LL=Yes' // Operator text for value (M_SUP_AL)= 1
      }            :BOOL;           // Suppress low alarm message
  M_SUP_AH {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_string_0:= 'Suppress HH=No';
    S7_string_1:= 'Suppress HH=Yes'
      }            :BOOL;             // Suppress high limit alarm message

  SP_OP_ON {S7_visible:='false';
      S7_dynamic:='true'    // CFC in test mode/IBS: Display of the actual
                               // value in the AS)
      }       :BOOL := 1;    // 1 = enable setpoint input

  SPBUMPON {S7_visible:='false';
       S7_link:='false';
       S7_m_c:='true';
       S7_string_0:='SP bumpless=Off';
       S7_string_1:='SP bumpless=On'
      }
                 :BOOL := 1;      // 1 = bumpless input of setpoint
  SP_EXTON {S7_visible:='false';
      S7_dynamic:='true'     // CFC in test mode/IBS: Display of the
                                // actual value in the AS)
      }
                 :BOOL := 1;         // 1: Enable external setpoint

  SP_EXT   {S7_dynamic:='true'}

                  :REAL := 0;        // External setpoint
  SP_HLM   {S7_visible:='false';
```

```
    S7_link:='false';
    S7_m_c:='true';
    S7_shortcut:='SP high limit';     // Text (max. 16 chars) for display on OS
    S7_unit:=''}                      // Unit (max. 16 chars)
                :REAL := 100;            // High limit of setpoint input

  SP_LLM    {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_shortcut:='SP low limit';
    S7_unit:=''}
                :REAL := 0;           // low limit of setpoint input

PV_IN {S7_dynamic:='true';
    S7_m_c:='true';
    S7_unit:='%'} :   REAL := 0;      // Process value (for Begleitwert_PR04)

GAIN   {S7_link:='false';
    S7_edit:='para';                  // Parameterization in the IEA
    S7_m_c:='true';
    S7_shortcut:='Gain';
    S7_unit:=''}        :REAL := 1;   // Proportional gain

  EV_ID   {S7_visible:='false';
    S7_link:='false';
    S7_param :='false';              // Parameter cannot be programmed in CFC
    S7_server:='alarm_archiv';        // Message no. assigned by server
    S7_a_type:='alarm_8p'             // Block reports with ALARM_8P
       }           :DWORD := 0;       // Message number

                                      // Parameters for SIMATIC BATCH
  STEP_NO {S7_visible := 'false';
      S7_m_c   := 'true'}  :DWORD;    // Batch step number
  BA_ID {S7_visible  := 'false';
     S7_m_c    := 'true'}  :DWORD;    // Consecutive batch number
  BA_EN {S7_visible := 'false';       // Parameter hidden in CFC chart
     S7_m_c := 'true'                 // Parameter supports O&M
     }              :BOOL := 0;       // Batch busy enable
  BA_NA {S7_visible := 'false';
     S7_m_c   := 'true'} :STRING[32] := '';  // Batch name

  OCCUPIED {S7_visible := 'false';
       S7_m_c   := 'true'} :BOOL := 0;        // Batch busy ID

  RUNUPCYC   {S7_visible:='false';
      S7_link:='false'} :INT := 3;     // Number of initial startup cycles
  SUPPTIME       :REAL := 0;          // Delay time
  SUPP_IN        :REAL := 0;         // Input value for delay time
END_VAR
```

```
VAR_OUTPUT
  LMN {S7_shortcut:='pressure';        // Name of the parameter on OS
    S7_unit := '%';                  // Unit of the parameter
    S7_m_c := 'true'                 // monitoring supported
    } :REAL;                        // Manipulated value

  QH_ALM  :BOOL := false;           // 1 = high limit alarm triggered

  QL_ALM  :BOOL := false;          // 1 = low limit alarm triggered

  QSP_HLM   {S7_visible:='false';
    S7_dynamic:='true'}   :BOOL := 0;  // 1 = setpoint output high limit active

  QSP_LLM   {S7_visible:='false';
    S7_dynamic:='true'}   :BOOL := 0;    // 1=Setpoint output low limit active

  Q_SP_OP   {S7_visible:='false';
    S7_dynamic:='true';
    S7_m_c:='true'}        :BOOL := 0;   // Status: 1 = Setpoint input enabled

  QOP_ERR   {S7_visible:='false';
    S7_dynamic:='true'}   :BOOL := 0;       // 1 = operator error

  QMSG_ERR   {S7_visible:='false';
    S7_dynamic:='true'}   :BOOL := 0;    // ALARM_8P: Message error

  MSG_STAT   {S7_visible:='false';
    S7_dynamic:='true'}   :WORD := 0;    // Message error information

  MSG_ACK   {S7_visible:='false';
    S7_dynamic:='true'}   :WORD := 0;    // Acknowledge messages

  SUPP_OUT                :REAL := 0;    // Output value for delay
  SP   {S7_dynamic:='true';
    S7_m_c:='true'}       :REAL := 0;    // Active setpoint

END_VAR

VAR_IN_OUT
  SP_OP {S7_visible:='false';
    S7_link:='false';
    S7_m_c:='true';
    S7_shortcut:='Setpoint';
    S7_unit:='%'} :   REAL := 0;           // Input of setpoint

 // user-specific associated message values of ALARM_8P

  AUX_PR05 {S7_visible := 'false'} : ANY;  // Associated value 5
  AUX_PR06 {S7_visible := 'false'} : ANY;  // Associated value 6
  AUX_PR07 {S7_visible := 'false'} : ANY;  // Associated value 7
  AUX_PR08 {S7_visible := 'false'} : ANY;  // Associated value 8
  AUX_PR09 {S7_visible := 'false'} : ANY;  // Associated value 9
  AUX_PR10 {S7_visible := 'false'} : ANY;  // Associated value 10

END_VAR
```

```
//*****************************************************************************
// Declaration section: Static variables
//*****************************************************************************
VAR
  sbRESTART   :BOOL := TRUE;       // Initial startup memory bit
  siRUNUPCNT  :INT := 0;           // Counter for RUNUPCYC execution
  sSUPP_IN    :REAL := 0;          // Old value of sample delay input
  ACT_TIME    :REAL := 0;          // Time counter

  srPV_IN     :REAL := 0;          // Associated value for PV_IN
  swSTEP_NO   :DWORD;              // Batch step number
  sdBA_ID     :DWORD;              // Batch ID

  sbyBA_NA    :ARRAY[1..32] OF BYTE := 32(0);

//*****************************************************************************
// Declaration section multiple instances
//*****************************************************************************
  OP_A_LIM_1:  OP_A_LIM;        // Operator control block 1
  ALARM_8P_1:  ALARM_8P;   // Generation of max. 8 messages with
                           // max. 10 associated values
END_VAR

//*****************************************************************************
// Declaration section: Temporary variables
//*****************************************************************************
VAR_TEMP
  // Start info: Structure with info for the OB that has just called the block
  TOP_SI:    STRUCT
   EV_CLASS :BYTE;
   EV_NUM   :BYTE;
   PRIORITY :BYTE;
   NUM      :BYTE;
   TYP2_3   :BYTE;
   TYP1     :BYTE;
   ZI1      :WORD;
   ZI2_3    :DWORD;
  END_STRUCT;

  // Start info: Structure with info for the most recently called startup OB
  START_UP_SI:  STRUCT
   EV_CLASS :BYTE;
   EV_NUM   :BYTE;
   PRIORITY :BYTE;
   NUM      :BYTE;
   TYP2_3   :BYTE;
   TYP1     :BYTE;
   ZI1      :WORD;
   ZI2_3    :DWORD;
  END_STRUCT;

  S7DT   :DATE_AND_TIME;          // Local time variable
  DUMMY  :INT;                    // Associated variable
END_VAR
```

```
//*****************************************************************************
// Code section
//*****************************************************************************
//*****************************************************************************
// Dependencies on the calling OB
//*****************************************************************************
   // Reading the start info by calling SFC6 (RD_SINFO)
   DUMMY := RD_SINFO (TOP_SI := TOP_SI, START_UP_SI := START_UP_SI);

 IF sbRESTART THEN
   // Initialization sequence
   TOP_SI.NUM := 100;   // Execution of the initialization sequence as restart
   sbRESTART := FALSE;  // Reset initialization sequence
 END_IF;

   // Which OB called the block?
 CASE WORD_TO_INT(BYTE_TO_WORD(TOP_SI.NUM)) OF

//*****************************************************************************
// Handling of error OBs
//*****************************************************************************
// OB80: Timeout error
    80:
    QH_ALM  := 0;           // Reset error outputs
    QL_ALM  := 0;
//*****************************************************************************
// Startup
//*****************************************************************************
// OB100: Restart
    100:
    QH_ALM  := 0;           // Reset error outputs
    QL_ALM  := 0;
    siRUNUPCNT := RUNUPCYC;  // Save RUNUPCYC value
 ELSE
//*****************************************************************************
// Input of setpoint SP_OP (REAL value) or interconnected setpoint SP_EXT
//*****************************************************************************
   //Multiple instance call OP_A_LIM
  // (For information on the meaning of the parameters, refer to the
     // Online Help OP_A_LIM)
   OP_A_LIM_1(U := SP_OP, U_HL:= SP_HLM, U_LL:= SP_LLM, OP_EN:= SP_OP_ON,
   BTRACK:= SPBUMPON, LINK_ON:= SP_EXTON, LINK_U:= SP_EXT);

   OK := OK AND ENO;//Accept Enable Out of OP_A_LIM in the OK flag of the block
                    //
   Q_SP_OP := OP_A_LIM_1.QOP_EN;  // 1: Enable SP input
   QOP_ERR := OP_A_LIM_1.QOP_ERR; // 1: Input error
   QSP_HLM := OP_A_LIM_1.QVHL;    // 1: High limit
   QSP_LLM := OP_A_LIM_1.QVLL;    // 1: Low limit
   SP    := OP_A_LIM_1.V;           // effective setpoint

//*****************************************************************************
// Technological section
//*****************************************************************************
IF (SUPP_IN <> sSUPP_IN) THEN
   ACT_TIME := SUPPTIME;          // Initialize timer
   sSUPP_IN := SUPP_IN;
END_IF;

  IF (ACT_TIME > 0) THEN           // If waiting time has not yet expired
   ACT_TIME := ACT_TIME-SAMPLE_T;  // count down waiting time
  ELSE
   SUPP_OUT := SUPP_IN;            // Transfer input value to output
  END_IF;
```

```
  LMN := GAIN * (SP - PV_IN);      // Calculate manipulated variable
  IF siRUNUPCNT = 0                // RUNUPCYC cycle already completed?
  THEN
   IF (PV_IN > H_ALM) THEN     // If the process value violates
                               // alarm high limits
     QH_ALM  := 1;             // set error output
     QL_ALM  := 0;             // reset error output

   ELSIF (PV_IN < L_ALM) THEN  // If the process value violates the
                               // alarm low limit
     QL_ALM  := 1;            // Set error output,
     QH_ALM  := 0;            // Reset error output
   ELSE
     QH_ALM  := 0;            // Reset error outputs
     QL_ALM  := 0;

   END_IF;
  ELSE
   siRUNUPCNT := siRUNUPCNT - 1;
  END_IF;
END_CASE;

//*****************************************************************************
// Reporting with ALARM_8P
//*****************************************************************************

  // STRING variables may not be interconnected as associated value with
  // ALARM8_P, and are therefore transferred in array of byte

    FOR DUMMY := 1 TO 32
     DO
      sbyBA_NA[DUMMY] := 0;    //delete array as default
     END_FOR;

     DUMMY := BLKMOV (SRCBLK:= BA_NA,DSTBLK:=sbyBA_NA);
     swSTEP_NO  := STEP_NO;    // Batch step number
                               // (due to I/O associated value ALARM_8P)
     sdBA_ID    := BA_ID;      // Batch ID
                               // (due to I/O associated value ALARM_8P)
     srPV_IN    := PV_IN;      // Associated value may not be an INPUT

 ALARM_8P_1(EN_R := TRUE,        // Update output ACK_STATE
      ID := 16#EEEE,             // Data channel for messages (always 16#EEEE)
      EV_ID:= EV_ID,             // Message number > 0
      SIG_1:= NOT M_SUP_AH AND QH_ALM,  // Signal monitored
                                        // 1 -> Message high limit alarm
      SIG_2:= NOT M_SUP_AL AND QL_ALM,  // Signal monitored
                                        // 2 -> Message low limit alarm
      SIG_3:= 0,                // monitored Signal 3 -> no message
      SIG_4:= 0,                // monitored Signal 4
      SIG_5:= 0,                // monitored Signal 5
      SIG_6:= 0,                // monitored Signal 6
      SIG_7:= 0,                // monitored Signal 7
      SIG_8:= 0,                // monitored Signal 8
      SD_1 := sbyBA_NA,         // Associated value 1
      SD_2 := swSTEP_NO,        // Associated value 2
      SD_3 := sdBA_ID,          // Associated value 3
      SD_4 := srPV_IN,          // Associated value 4
      SD_5 := AUX_PR05,         // Associated value 5
      SD_6 := AUX_PR06,         // Associated value 6
      SD_7 := AUX_PR07,         // Associated value 7
      SD_8 := AUX_PR08,         // Associated value 8
      SD_9 := AUX_PR09,         // Associated value 9
      SD_10:= AUX_PR10);        // Associated value 10

    QMSG_ERR := ALARM_8P_1.ERROR;     // ERROR status parameter
    MSG_STAT := ALARM_8P_1.STATUS;        // STATUS parameter
    MSG_ACK := ALARM_8P_1.ACK_STATE;  // Actual OS acknowledgment status
END_FUNCTION_BLOCK
```

2 Configuring faceplates

2.1 General notes re configuration

2.1.1 Requirements and previous experience

The next chapters provide all information users need to create a faceplate for PCS 7. This comprises information about using the corresponding WinCC tools and in particular about working with Faceplate Designer.

Note

The block icons and faceplates included in this description represent examples which may deviate in certain details from actual objects visualized.

Requirements and previous experience

The faceplates described in this documentation are designed for applications in WinCC. You need the WinCC basic package which contains the process control options "Basic Process Control" and "Advanced Process Control" in order to create faceplates.

Knowledge requirements:

- SIMATIC WinCC System Course
- SIMATIC WinCC Openness N

These courses are offered at the A&D Training Center.

2.1.2 Creation phases

2.1.2.1 Roadmap to creation

The steps outlined below show the best practice in creating faceplates:

- Design of the faceplate
- Configuring the faceplate
- Test of the faceplate

2.1.2.2 Design of the faceplate

Representation

A faceplate represents the O&M interface to an AS block. There are two options of visualizing a faceplate:

- **Group display:** Visualization of AS values in different views, with element for selecting the loop display
- **Loop display:** Visualization of the elements of all views of the group display

System attributes

You define which particular input, output and in/out parameters of an AS block can be controlled and monitored by configuring the system attributes when you create the AS block. For detailed information about these system attributes, refer to the chapter "AS block structure".

Parameters

Parameter selection criteria:

- Specific data the operators require to quickly and definitely register actual states
- How to visualize these values
- Particular values which can be edited by operators
- User access rights
- Process-dependent interlocks of operator input
- Specific faceplate views for the visualization of values

  Tip: Group the parameters based on functions. Insert essential elements and in particular dynamic elements into the "Standard" view.

Design

After having defined the parameters and their visualization, continue with the faceplate design:

- Select the faceplate elements
- Name the faceplate elements
- Program the faceplate elements
- Position the faceplate elements

Use pronounceable names which relate to the objects to be visualized.

Example

Assign the name "OCCUPIED" to the status view which is used to visualize the "OCCUPIED" variable.
This procedure facilitates project documentation and maintenance.

2.1.2.3 Configuring the faceplate

WinCC Graphics Designer

Use the "WinCC Graphics Designer" tool of your SW package to configure the faceplates. Using the templates of Faceplate Designer, implement the WinCC pictures based on your faceplate design. For detailed information, refer to chapter 2.1.3, "Creating faceplates using Faceplate Designer".

2.1.2.4 How to test a faceplate

Procedure

To test the faceplate:

1. In WinCC Explorer, check the properties of the pictures you created based on the following criteria:
   - Correct spelling of the parameter names
   - Parameters visualized at multiple instances are assigned the same WinCC cycle Different cycles are liable to cause confusion among operating personnel, for example, due to inconsistency developing between the bar graph and numerical displays, and also increase communication load on the system
   - Correct direct connections
   - All event-controlled scripts are available
2. In WinCC Runtime, check the properties of the pictures created based on the criteria listed below:
   - The faceplate opens in the group display when the user clicks the block icon
   - The views can be toggled appropriately in the group display
   - The faceplate opens in the loop display when the user clicks the "Loop display" button
   - The correct values of the AS block are returned
   - Correct visualization of the message and trend view
   - Proper functioning of the input enable function for controlling parameters
   - Values input by the operator are written to the AS block
   - Faultless operating log

2.1.3 Creating faceplates using Faceplate Designer

2.1.3.1 Faceplate Designer

The Faceplate Designer tool is part of the WinCC optional package "Advanced Process Control". This tool generates templates for the PCS 7-compliant creation of faceplates.

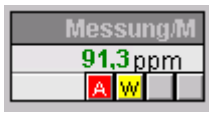
2.1.3.2 Templates of Faceplate Designer

Templates provided in WinCC for the creation of faceplates:

- Block icons (default symbols for process pictures)
- Picture templates
- Object toolkit for the creation of faceplates
- Global scripts

2.1.3.3 Block icon templates

WinCC picture "@@PCS7Typicals.pdl"



The block icons for objects such as valves, drives, measured values and controllers are available in the WinCC picture "@@PCS7Typicals.pdl".

- The user can quickly modify the templates, for example, in terms of their shape, color and design, and adapt these to suit requirements of project-specific faceplates
- The default call scripts for the faceplates are already included and do not need to be configured
- Interconnections are quickly and easily configured using the "Interconnect faceplate with process tag" Dynamics Wizard

  For further information, refer to chapter 2.8, "Block icons".

Note

After having completed your changes, save the picture to the file named "@PCS7Typicals*.pdl".
This name is the initial search criteria for the TH search engine. The program only uses the templates in "@@PCS7Typicals.pdl" if the search is unsuccessful.

2.1.3.4 Picture templates

Pictures and bitmaps

The pictures and bitmaps are copied from the "WinCC\options\pdl\FaceplateDesigner_V6" folder and to the project using OS Project Editor. Refer to "OS Project Editor basic data" in the online help system.

Object toolkit

The WinCC picture "@PCS7Elements.pdl" contains a number of object templates, i.e. user objects such as IO fields and texts, which can be used to create a faceplate.
The picture is available in "Siemens\WinCC\options\pdl\FaceplateDesigner_V6" and is copied from there to the "GraCS" subfolder of the project folder when you run the OS Project Editor session.

For further information, refer to chapter 2.3, "Basic elements".

Global scripts

Runtime functions or faceplate calls are available as global scripts in the "WinCC\aplib\FaceplateDesigner_V6" folder.

For further information, refer to chapter 2.4, "Scripts".

2.1.3.5 Configuring sequence

Notes re configuration

To observe when configuring faceplates:

- The faceplates created in Faceplate Designer are initially saved to the "GraCS" folder of your currently active project
  User-specific faceplates can be saved to the "\Siemens\WINCC\options\pdl\FaceplateDesigner" folder and are there available to all other projects

  In OS Project Editor, you can select the default faceplates to copy from "\Siemens\WINCC\options\pdl\FaceplateDesigner_V6", and the user-specific faceplates to copy from "\Siemens\WINCC\options\pdl\FaceplateDesigner" to the project when generating the basic data
- Also copy the data from "\Siemens\WINCC\options\pdl\FaceplateDesigner" to the corresponding folder which contains the WinCC clients

Using the "Global Script" editor you can read/write protect functions configured for user-specific faceplates.
For further information, refer to "Global Script" editor documentation.

- The dynamic functions of faceplates created in Faceplate Designer can be controlled by means of configuration data In particular the performance of a faceplate is determined by the selection of a suitable dynamics configuration An important aspect is an optimized, lean interface between the AS and OS function This especially applies to the block icons

---

Note

It is advisable in this context to implement the new status word "VSTATUS" introduced in V6 for integration in the AS blocks in particular for block icons in order to cut down on variable interconnections.
The new status word could not be used in this case, as the default symbols must be compatible with V5 in order to be able to visualize AS blocks of this version.

- The type-specific dynamic functions of the faceplates may not be controlled using C-syntax scripts which contain fixed coding of instance names

2.1.4 Access control

2.1.4.1 Assigning user rights

Assigning instance-specific user rights

The system supports the assignment of instance-specific user rights at the faceplates.

The configuration and instance-specific data are saved to the block icon files.

The block icon features the "Processcontrolling_backup" and "HigherProcesscontrolling_backup" properties at which you can configure user rights for process control and for higher-priority process control.

The information is transferred to the faceplate by means of script.

The default access levels 5 and 6 set at the properties can be changed as required. However, you should note that levels 1 to 10 are assigned permanent definitions in WinCC.

The assignment of one of these access levels to specific parameters is derived from the previous faceplates. Process control operations such as "On", "Off", "Manual", "Auto", "Set setpoint" are assigned access level 5, whereas higher-priority parameters such as "Limits" or "Control parameters" are assigned access level 6.

Area-specific user rights

Area-specific user rights are retained as usual.

Area-specific user rights are verified on the basis of the assigned variable name, (tag name). However, it is necessary in this context to configure the corresponding area name at the "OS area" parameter of the TH, and that this setting matches the actual OS area in the Picture Tree.

2.1.4.2 Configuring user rights for basic elements

Objects "@Level5" and "@Level6"

The "@Level5" and "@Level6" objects of the views generated by Faceplate Designer can be used to configure user rights.

New basic elements of a view can be directly interconnected with the "@Level5" und "@Level6" objects.

You may not delete these objects, as they receive data from the scripts.

The "Background color" and "Control enable" properties are logically linked in order to gray out the field if a user is not authorized.

In order to enable user login to objects for AS parameters, the password level can also be interconnected by means of direct connection. Instead of graying out the objects when user login is not authorized, the program outputs a "No permission" message box.

A more practical means of combining WinCC and process-specific permissions in a control element of the basic elements is provided by the "Permission" object. The object properties are described in this element.

The values of these properties are controlled by the "PCS7_UpdatePermission_V6" script.

Access level 5 is set at "@Level5", and access level 6 is set at "@Level6" by default. The values returned at the block icon using the "Processcontrolling_backup" and "HigherProcesscontrolling_backup" properties can be modified for specific instances.

Procedure

1. Select the object, for example @Level6, for the access rights level required, and then select "Object properties".
2. On the "Event → Property topics → Colors → Background color", select a direct connection as action
3. Select the new object from the "Target" field on the right pane and the "Object in picture" field to select the background color as property
4. On the "Event → Property topics → Other → Operator control enable" tab, select a direct connection as action
   A script which is already available for this event simultaneously controls the background color if the enable signal for user input is controlled by an AS variable In this case, you must delete the script
5. Select the new object from the "Target" field on the right pane and the "Object in picture" field to set the enable operator input property

When installing additional objects in a view, select the object most recently interconnected by means of direct connection, and then repeat the operations described earlier.

Important!

The configuration of the "Background color" and "Operator input enable" must match the configuration at "@Level5" and "@Level6". Example: background color = "gray", and operator input enable = "false". This ensures proper functioning of the scripts.

Background information:

If the script is used to set a value at the property and this value already exists in the configuration of this property, the value is not transferred to other properties by means of the direct connection. You should therefore make sure that the configured values of target properties which receive data at the direct connection match the values of the source properties.

2.1.5 Changing the overview

Creating a faceplate without messages and / or without group display

When creating such a faceplate, you should delete certain elements and scripts from the "@PG_XXXXX_Overview.Pdl" in order to enhance performance. Elements and scripts to remove:

- Button16, message acknowledgment
- Button17, disable/enable messages
- @Level5, access rights
- MSG_LOCK, symbol for message suppression
- In the actual picture object, the script of the "Picture selection" event
- Also delete the batch symbol "OCCUPIED“ if the "Occupied" batch parameter does not exist

You can also enhance performance by activating the "no group display" and "no batch parameters" check boxes in Faceplate Designer.

2.1.6 Configuring multiple instances

Multiple instance

The term “multiple instance” denotes the existence of several blocks which are configured in a CFC chart and can be controlled and monitored at a faceplate on the OS.

Configuration

The symbol is always interconnected in your configuration data with a complete variable name.

The check of user rights always encompasses the variable name selected and the entire faceplate.

Set the property MULTI_INSTANCE = 'true' at the "@Faceplate" object in the "@PG_xxxxx.pdl" and "@PL_xxxxx.pdl" pictures so that the program is able to detect the "Multiple instance" type and truncate the block name from the variable name after user rights were confirmed.

Append the /blockname string to all variable interconnections in the faceplate.

Example: **/Controller.PV_IN.**

Important: This action also has to be executed in the scripts!

Add these supplements to all interconnections of the OVERVIEW picture.

Define the properties of the batch parameters for the operating log of a block at the "@Faceplate" object in the "@PG_xxxxx.pdl" and "@PL_xxxxx.pdl" pictures. Multiple instance technology is ignored in this case. Special use cases such as different BatchIDs or StepNos. for different blocks are covered by script control when you select pictures in the various views.

The multiple instance technology is ignored in the trend view when "Mode = 2" is set.

Visualization of online trends is only available for the variable name stored at the block icon. You can set other modes in order to view the trends of several blocks.

Integrating several blocks with message functionality

In order to integrate several blocks with message functionality, the following items must also be observed and implemented in the OVERVIEW picture:

- A sufficient number of group displays must be installed to match the number of message blocks installed
- Enhance the script with a function for controlling the message acknowledgment button
  Script "Button16/Mouseclick".
  The "CSigAPIAcknowledgeTagAndCreateLTM" function must be executed at each instance when you acknowledge a message

  Example:

```
TCHAR sztag1[_MAX_PATH + 1] = "";

TCHAR sztag2[_MAX_PATH + 1] = "";


GetComputerNameA(szStation, &dwSize);

pszParentPicture = GetParentPicture(lpszPictureName);

lpszCurrentUser  = GetPropChar(pszParentPicture ,"@Faceplate","CurrentUser");

pszTagname = GetPropChar(pszParentPicture ,"OverviewWindow","TagPrefix");


strcpy(sztag1,pszTagname);

strcpy(sztag2,pszTagname);

strcat(sztag1,"/Instanz1");

strcat(sztag2,"/Instanz2");

printf ("sztag2 : %s\r\n", sztag2);


if (!CSigAPIAcknowledgeTagAndCreateLTM(sztag1, lpszCurrentUser , szStation, &Err))

      printf ("Error at CSigAPIAcknowledgePicture : %s\r\n", Err.szErrorText);

if (!CSigAPIAcknowledgeTagAndCreateLTM(sztag2, lpszCurrentUser , szStation, &Err))

      printf ("Error at CSigAPIAcknowledgePicture : %s\r\n", Err.szErrorText);
```

- Enhance the script with a function for controlling the "Disable/enable messages" button
  Script "Button17/Mouseclick".
  The "CSigAPILockMessage" function must be executed at each instance when the "Disable/enable messages" button is activated

  Example:

```
DWORD dEventState1 =  GetPropWord(lpszPictureName,"EventState","CollectValue");
DWORD dEventState2 =  GetPropWord(lpszPictureName,"EventState2","CollectValue");
TCHAR sztag1[_MAX_PATH + 1] = "";
TCHAR sztag2[_MAX_PATH + 1] = "";

pszParentPicture = GetParentPicture(lpszPictureName);
pszTagname = GetPropChar(pszParentPicture ,"OverviewWindow","TagPrefix");
lpszCurrentUser  = GetPropChar(pszParentPicture ,"@Faceplate","CurrentUser");
GetComputerNameA(szStation, &dwSize);

strcpy(sztag1,pszTagname);
strcpy(sztag2,pszTagname);
strcat(sztag1,"/R");
strcat(sztag2,"/M");

if ((dEventState & 65536) == 65536)
{
    bRet =  CSigAPILockMessage(FALSE, sztag1, lpszCurrentUser  ,  szStation, &Err);
    SetPictureUp(lpszPictureName,lpszObjectName,"@Lock.bmp");
}
else
{
   bRet =  CSigAPILockMessage(TRUE, sztag1, lpszCurrentUser  ,  szStation, &Err);
   SetPictureUp(lpszPictureName,lpszObjectName,"@Unlock.bmp");
}

if ((dEventState2 & 65536) == 65536)
{
    bRet =  CSigAPILockMessage(FALSE, sztag2, lpszCurrentUser  ,  szStation, &Err);
```

```
    SetPictureUp(lpszPictureName,lpszObjectName,"@Lock.bmp");
}
else
{
   bRet =  CSigAPILockMessage(TRUE, sztag2, lpszCurrentUser  ,  szStation, &Err);
   SetPictureUp(lpszPictureName,lpszObjectName,"@Unlock.bmp");
}
```

- Install a message suppression symbol (MSG_LOCK) for all blocks with message functionality
- Integrate an OCCUPIED symbol for all batch-relevant blocks

2.1.7 Configuring number formats

New properties for number formatting

The relevant block icons are assigned three new number formatting properties:

Format_InputValue	For input values such as "Setpoint" and "ProcessValue" at the block icon
Format_OutputValue	For the manipulated variable at the block icon
Format_xx	For any other values

Note

The terms "Format_InputValue" and "Format_OutputValue" selected in this context are process-oriented and are not directly relevant to the I/O of the AS block parameters.

Example: The FMT_PID parameter "PV" represents an output parameter at the AS block, however, in terms of the process it represents an input variable.

Format_InputValue and **Format_OutputValue** are used to format the analog values of the block icon.

With default setting, **Format_InputValue** returns floating decimals and two floating decimal places. It always returns at least one decimal (0.##).

With default setting, **Format_OutputValue** returns floating decimals and two floating decimal places. It always returns at least one decimal (0.##).

The project engineer can adapt these default settings to suit a specific instance.

All three format properties of the block icon are transferred to the faceplate by script, and can there be assigned to the analog values via direct connection.

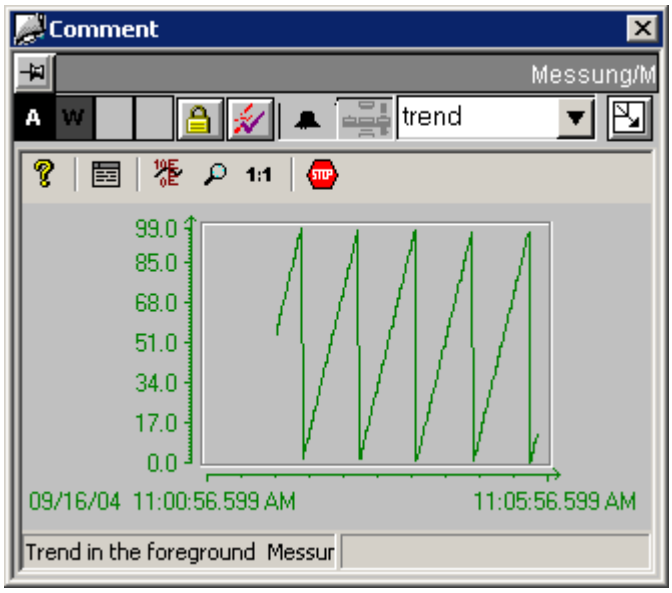
Details:
The format properties of the block icon are transferred and saved to the “Format” object of the parent prototype picture "@PG_xxxxx.pdl" using the "PCS7_OpenGroupDisplay_V6" script.

If a view contains a "Format" object that is assigned the "Format_InputValue, Format_OutputValue, Format_xx" properties, these formats are transferred directly to this object using the "PCS7_Format_V6" script when a picture is selected.

From this object you can assign these three formats to any analog value in this view by creating a direct connection.

2.1.8 Configuring the trend view

Implementing trend pictures



The block icons of the program provide new properties which can be used, for example, to integrate controller or measurement functions when you implement trend views:

- **ReturnPath:** Transfers trend data for the corresponding process tag
- **StandardTrend:** Used to define the trend functionality to be visualized in the trend view

Default trend:	**Mode**
0	Trend functionality similar to V5, i.e. a separate trend picture must be configured for each instance. The trend view "@PCS7_TREND.pdl" is available for all PCS7 faceplates and contains the "TrendPicture" window. To visualize the trend view of a process tag on this area: 1st Open WinCC Editor "Tag Logging". 2nd Create a variable archive for the trend view using the Archive Wizard. 3rd Create the variables for this archive. For detailed information about the steps mentioned earlier, refer to the WinCC Online Help, index "Tag Logging". 4th Open the "@CONL1_Standard.pdl" picture in Graphics Designer. 5th Configure the TlgOnlineTrend object "Control1" to suit requirements. Click "Help" for further information. 6th Save the picture to a file named "@CONL1_<tagname>.pdl". The variable name <tagname> must match the name of the process tag of the AS block. Replace the "/" with the "_" character in the name, because Windows does not support the "/" character in file names. Example of the window name of a process tag with the variable name "Measurement/M“ @CONL1_Messung_M.pdl
2	A "@CONL1_Standard.pdl" picture is called where you enter one or several online variables. An archive is not required. x axis = 5 min This is the default setting as you neither have to make provisions in configuration data nor have to comply with naming conventions in terms of the visualization of trends. The **ReturnPath** property in the block icon returns the number of trends, the name of the structure element and the color.
>2	A "@CONL1_Standard.pdl" picture is called where you enter one or several online archive variable names. You must comply with conventions outlined below in order to ensure proper functioning of this configuration without having to program further functions: • The archive must be named "Prozesswertarchiv", regardless of the language setting. • The archive and the variable must be available on the same server. • The archive variable name must comply with the default name you assign when creating the archive variable. • If the server prefix is included in the variable name of the "tagname" property of the block icon, the server prefix must be set without "::" in the archive variable name. • If the variable name entered in the "tagname" property does not contain a server prefix, the archive variable name must match the variable name. **Note:** The archive variable name is represented in previous versions by the "tagname" without "/" separators. In V6 or higher, the archive variable name corresponds with the "tagname". The archive variable must be assigned this name in order to ensure proper functioning of the trend in the faceplate. The **ReturnPath** property in the block icon is used to return the number of trends, the variable name and the color. in this mode, the duration of the axis x cycle (in minute units) is read from parameter "StandardTrend".

Default trend:	**Mode**	
	ReturnPath syntax:	
	.PV_IN	Structure element name with dot for the initial trend
	:	Separator between the structure element name and the color
	CO_GREEN	Color of the first trend
	,	Comma for a further trend
	Example: .PV_IN:CO_DKGREEN,.SP:CO_BLUE,.LMNR_IN:CO_DKRED (default setting for CTRL_PID)	
	The example shows three controller trends, that is, the actual value, setpoint and manipulated value feedback. If you cannot adhere to the four conventions mentioned earlier, you can expand the "ReturnPath" property by assigning additional parameters: ***tagname:** individual archive variable name ***archivname:** individual archive name (entered without „\") ***archivserver:** The trend is available on an archive server. Enter the server prefix of the archive server without "::" characters **Example:** .PV_IN:CO_DKGREEN,.SP:CO_BLUE,.LMNR_IN:CO_DKRED*tagname: MySpecialTag*archivname:MySpecialArchivname*archivserver: MySpecialArchivServer **Note:** You can only define a "tagname", "archivname" or the "archivserver" at the end of the strings. Adapt the archive variable names accordingly when using multiple instances. The archive variable may only differ in term of member variables. **Example of a multiple instance:** The CFC chart "MULTI" contains the MEAS_MON blocks "M1" and "M2". The program generates the default names "MULTI/M1.U" and "MULTI/M2.U" as archive variable names for process value "U".	
	***asia:**	add server prefix to archive tag If parameter *asia: is not used, any existing server prefix in "tagname" is also included in the derivative of the archive tag name. If "tagname" does not contain a server prefix the program does not make allowances for a server prefix in the derivative of the archive tag name. ***asia:MyServerPrefix** The archive tag name contains a server prefix without "::" and the "tagname" property of the block icon does not contain this prefix. In this case you can supplement the server prefix (enter without "::"). ***asia:** The archive tag name does not contain a server prefix. In this case you can hide the server prefix. This variant should also be used if the "tagname" property at the server does not contain a server prefix entry, as the server prefix is always available when the client calls the picture.

Default trend:	**Mode**
	Rename the archive tags to "MULTI.M1_U“ and "MULTI.M2_U“ Text string in the **ReturnPath** of the block icon**:** .M1_U:CO_DKGREEN,.M2_U:CO_BLUE*tagname:MULTI*archivname:SystemArchive Example of *asia: Show server prefix: .U:CO_DKGREEN*asia:OS(1)_PC2 Example of *asia: Hide server prefix .U:CO_DKGREEN*asia:

The table below show additional parameters to be set depending on the certain criteria:

- Structure of the archive tag name and tag names in the block icon
- Source from which the faceplate is called
- Archive tag on the separate archive server

	Server	Client with server picture	Client with client picture	Client with server picture and archive tag on separate archive server	Client with client picture and archive tag on separate archive server
Tag name **without** server prefix Archive tag name **without** server prefix	*asia:	*asia:	not supported, "tagname" always contains the server prefix	*asia: *archivname: MyArchivserver prefix	not supported, "tagname" always contains the server prefix
Tag name **with** server prefix Archive tag name **without** server prefix	*asia:	*asia:	*asia:	*asia: *archivname: MyArchivserver prefix	*asia: *archivname: MyArchivserver prefix
Tag name **without** server prefix Archive tag name **with** server prefix	*asia: MyServer prefix	*asia: MyServer prefix	not supported, "tagname" always contains the server prefix	*archivname: MyArchivserver prefix	not supported, "tagname" always contains the server prefix
Tag name **with** server prefix Archive tag name **with** server prefix	**no settings required in recommended tag configuration**	**no settings required in recommended tag configuration**	**no settings required in recommended tag configuration**	*archivname: MyArchivserver prefix	*archivname: MyArchivserver prefix

The block icon returns the values of the "StandardTrend“ and "ReturnPath“ properties to the faceplate when prototype picture "@PG_xxx“ is called.

The prototype picture contains a "Trend functions" object assigned the "StandardTrend" and "ReturnPath" properties. These are used to store the data which are evaluated using the "PCS7_Trend.fct" script when the user selects the "@PCS7_Trend.pdl" picture.

The same functionality is transferred to the loop display.

2.1.9 How to configure an AS block type with different block icons and faceplate types

Procedure

You only need to change the "type" property at the block icon to generate a symbol variant for the AS block.

Any faceplate variant you may want to generate for an AS block must be assigned a name other than that of the AS block type. Example: variation of "MEAS_MON" is the faceplate name "MEAS_NEW".

Settings to make at the block icon:

1. Rename the "Servername" property to "PCS7 MEAS_NEU Control".
2. Create a new "StructureType" property at the block icon which contains the AS block type ("MEAS_MON")
   This is necessary to ensure that the "Link faceplate to process tag“ wizard is still able to select the variable

2.1.10 WebClient (differences compared to WinCC)

2.1.10.1 Differences in terms of faceplate configuration

The next section shows which differences between WinCC

and WebClient should be taken into consideration.

2.1.10.2 Picture names

Addressing

WinCC scripts deploy absolute or relative addressing of picture names.

Example:

- absolute

  @screen.@win12:@1001.@top09:@pg_elap_cnt.OverviewWindow:@PG_ELAP_CNT_OverView.pdl

- relative

  @PG_ELAP_CNT_OverView.pdl

The WebClient only supports relative addressing within the script context.

Also, you should define the picture window name instead of the picture name as address when using WebClient scripting.

Example:

SetPropChar(lpszPictureName,lpszObjectName,lpszPropertyName,szValue);

WinCC: the lpszPictureName is a pointer to the picture name

WebClient: lpszPictureName is a pointer to the picture window name

Exceptions are the picture to which the script belongs and the parent picture (ParentPicture), i.e. the picture name can be used as pointer. It is advisable always to use the picture window name as the pointer to this name is unambiguous. The picture name may be ambiguous.

Example of relative picture addressing:

The @PG_xxx.pdl picture contains a "View" window which is used, for example, to visualize the default view of a faceplate.
When addressing a different window of the @PG_xxx.pdl picture in the screen which returns the default view in the "View" window, the relative window address is determined as shown below:

sprintf(szPictureName,"../OperationWindow");

2.1.10.3 Case-sensitivity in file names

File names, for example for pointers to picture names, are generally provided in WinCC as created, that is, in uppercase format. Example: @PG_MEAS_MON.PDL.

On the Web client, the file names are supplied as created, for example, @Pg_Meas_Mon.pdl.

It may be necessary to adapt these names when comparing strings.

Example:

(strcmp(GetPictureUp(lpszPictureName,lpszObjectName), "@KEEPVISIBLEON.EMF") == 0)

This adaptation is not subject to any limitation in WinCC. However the Web function supports this adaptation only for file names consisting of uppercase letters.

Adaptation required:
(strcmp(_**strlwr**(GetPictureUp(lpszPictureName,lpszObjectName)), "**@keepvisibleon.emf**") == 0)

2.1.10.4 Loading pictures in picture windows

Differences in WinCC compared to WebClient in terms of the loading pictures in the windows:

- WinCC
  After having loaded a picture to a window in WinCC, for example, using the SetVisible function, you can directly address and edit their objects by calling the scripting function.
- WebClient
  Pictures are loaded on the WebClient in asynchronous mode. You need to implement a delay in the scripts for this reason in order to delay further execution of the script if this is also used to address picture objects
  The WebClient is provided the corresponding **WaitForDocumentReady("Window name");** function
  This function delays script execution until the window name parameter reports a loaded picture

2.1.10.5 Deselecting pictures within scripts

Differences in WinCC compared to WebClient in terms of deselecting pictures within scripts:

- WinCC
  WinCC supports the "Set invisible" picture function in scripts executed within the context of this picture, that is, the function can be executed at any section of the script, as the script execution task continues scripting independent of the closed picture.
- WebClient
  On the WebClient, the "Set invisible" function must be the last action executed in the script
  All script instructions following "set invisible“ are no longer executed as the script terminates at this point

2.1.10.6 Distinguishing between the WinCC <-> Web runtime environments

It is necessary to be able to distinguish between the WinCC and WebClient runtime environments when running scripts for graphical picture objects or project functions.

The program provides the corresponding compiler instructions:

- #ifdef RUN_ON_WEBNAVIGATOR
- #ifndef RUN_ON_WEBNAVIGATOR (= negation)

These instructions can be used, for example, to make allowances for the differences between WinCC and WebClient as shown below:

- Script delay using WaitForDocumentReady
- Different picture addressing
- Different function names for process control functions
- Functions not to be supported in WebClient

Example of the PCS7_ChangeView script

```
#ifdef RUN_ON_WEBNAVIGATOR
        SetPropChar("../", "View", "PictureName", szViewName);
        WaitForDocumentReady("../View");
#else
        SetPropChar(lpszParent, "View", "PictureName", szViewName);
#endif
```

Note

Instead of checking the syntax of the Web code section when you compile the WinCC script, the program checks it only when you publish the pictures.

2.1.10.7 Function names in WinCC/Web

List of supported functions

The action-triggering functions were mapped to other function names for the Web in order to trigger the action in the Webnavigator Client instead of triggering it in WinCC Runtime.

Example:

SSMRTChangeWorkdfield modifies the working window in WinCC Runtime and

SSMChangeWorkdfield modifies the working window in the WebClient.

A list of supported functions and their names is available in the corresponding product descriptions. The "Faceplate Designer" product supports the following functionality:

void PCS7_ChangeView(char* lpszPictureName, char* lpszObjectName);

BOOL PCS7_CheckPermission(char* lpszTagname, DWORD dwLevel);

void PCS7_UpdateGroupPermission(char* lpszPictureName);

void PCS7_UpdateGroupTagname(char* lpszPictureName, char* lpszObjectName, char* value);

void PCS7_UpdateLoopTagname(char* lpszPictureName, char* lpszObjectName, char* value);

void PCS7_UpdatePermission_V6(char* lpszParentPictureName, int CallFrom, char* lpszPictureName);

void PCS7_OpenGroupDisplay_V6(char *lpszPictureName, char *lpszObjectName);

void PCS7_OpenLoopDisplay_V6(char* lpszPictureName);

void PCS7_OpenInputBoxBin_V6(char *lpszPictureName,char *lpszObjectName, int CallFrom);

void PCS7_1vnStati_Variable_Changed_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName, double value);

void PCS7_OperationLog_V6(char* lpszPictureName, double dOldValue, double dNewValue, char* lpszOperationText, char* lpszUnit);

void PCS7_Trend_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName, char * ArchivVar, char* OnlineVar, DWORD TrendColor, int CallFrom);

void PCS7_UpdateGroupTagname_V6(char* lpszPictureName, char* lpszObjectName, char* value);

void PCS7_UpdateLoopTagname_V6(char* lpszPictureName, char* lpszObjectName, char* lpszTagName);

void PCS7_UpdateBarLimits_V6(char* lpszPictureName, char* lpszObjectName, int CallFrom);

void PCS7_UpdateBar_V6(char* lpszPictureName, char* lpszObjectName, int CallFrom);

void PCS7_OpenInputBoxAnalog_V6(char *lpszPictureName,char *lpszObjectName,int CallFrom);

void PCS7_OpenGroupDisplay_I_V6(char *lpszPictureName, char *lpszObjectName, char*lpszInterlokName);

void PCS7_OpenComboBox_V6(char *lpszPictureName,char *lpszObjectName,int CallFrom);

void PCS7_OpenCheckBox_V6(char *lpszPictureName,char *lpszObjectName, int CallFrom);

void PCS7_Open3ComboBox_V6(char *lpszPictureName,char *lpszObjectName,int CallFrom);

void PCS7_Format_V6(char* lpszPictureName, char* lpszObjectName, int CallFrom,char* lpszParent);

void PCS7_Combo_OK_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName);

void PCS7_Check_OK_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName);

void PCS7_Binary_OK_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName);

void PCS7_AnalogPercent_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName,double Percent);

void PCS7_Analog_OK_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName);

void PCS7_3Combo_OK_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName);

void PCS7_2Stati_Variable_Changed_V6(char* lpszPictureName, char* lpszObjectName, char* lpszPropertyName, double value);

2.1.10.8 Global script

"Global Script" is not supported for the WebClient because it has no separate "Script.exe“ application.

Global functions must be saved as project functions. They are otherwise included in the compilation when you publish the data.

2.1.10.9 VBS Script

It is advisable to create new functions in VBS, as you do not have to make allowances in VBS for differences between WinCC and the WebClient.

2.1.10.10 Notes

By contrast to WinCC, scripts on the WebClient which are written in C do not provide global tags which can be shared by all pictures.

It is advisable to discard cyclic synchronous functions, as these generate longer runtimes on the WebClient compared to WinCC.

2.1.11 Changing languages

The templates of Faceplate Designer are created in three languages: namely German, English and French. All texts are output in the relevant language set in WinCC. When installing additional text elements in a picture with optional language selection, these texts must be entered in Graphics Designer in all regional languages required. You change the language by selecting the **View > Language... > Select language** command in Graphics Designer

2.1.12 Texts for the input of analog and binary values from the ES

Setting the language

The comment texts of binary and analog value displays, combo boxes, check boxes and operating logs are read from the parameter attributes of the block instances.

Note that all default texts in the ES for the "s7_shortcut", "s7_unit", "S7_string_0" and "S7_string_1" attributes are configured in English language.

In previous versions, the ES texts were only used for the operating log in the faceplates. In the faceplate views, the texts were previously created in WinCC and were made available in three regional languages.

Translate these ES texts into the language required when migrating to another version. Use the IEA if necessary.

Multilingual texts

You can translate any texts for multilingual applications using the Text Library Editor in WinCC. In SIMATIC Manager, set the default dialog language, i.e. usually "English", for display devices which contain the control and display texts configured in STEP 7 and in the ES. This prevents overwriting of translated texts when you compile the OS.

Important information

As the default texts are already available in English language in the ES, you should always create a project library for the AS blocks and translate their default English texts into the required language when you configure a project in a language other than English.

Make sure that the new texts do not exceed the length of the default texts. Verify that the texts are properly output to the faceplate if you cannot avoid longer texts.

For further information on the creation of project libraries, refer to the ES Configuration Manual.

You can ignore attribute "s7_unit" for translation, as space characters or internationally used short names were used in the default settings.

List of parameter attributes to be adapted

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
CTRL_PID	AUT_ON_OP		Mode= Manual	Mode= Auto
	DEADB_W	Deadband		
	ER_HYS	ER hysteresis		
	ERH_ALM	ER: HH alarm		
	ERL_ALM	ER: LL alarm		
	GAIN	GAIN		
	HYS	Hysteresis		
	LMNR_IN	OUT		
	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_AL		Suppress LL=No	Suppress LL=Yes
	M_SUP_ER		Enable ER Alarm	Suppr. ER Alarm
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	M_SUP_WL		Suppress L=No	Suppress L=Yes
	MAN_HLM	MAN high limit		
	MAN_LLM	MAN low limit		
	MAN_OP	MAN		
	MO_PVHR	Bar HL		
	MO_PVLR	Bar LL		
	OOS		In Service	Out of Service
	OPTI_EN		Disable Optimiz.	Enable Optimiz.
	PV_IN	PV		
	PVH_ALM	PV: HH alarm		
	PVH_WRN	PV: H alarm		
	PVL_ALM	PV: LL alarm		
	PVL_WRN	PV: L alarm		
	SP_HLM	SP high limit		
	SP_LLM	SP low limit		
	SP_OP	SP		
	SP_TRK_ON		No Tracking	Track SP:= PV
	SPBUMPON		SP may bump	SP bumpless
	SPDRLM	Neg. ramp		
	SPEXTSEL_OP		SP= Internal	SP= External
	SPRAMPOF		SP Ramp On	SP Ramp Off
	SPURLM	Pos. ramp		
	TM_LAG	Lag time		
	TN	TI		
	TV	TD		

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
CTRL_S	AUT_ON_OP		Mode= Manual	Mode= Auto
	BREAK_TM	Break time		
	DEADB_W	Deadband		
	ER_HYS	ER hysteresis		
	ERH_ALM	ER: HH alarm		
	ERL_ALM	ER: LL alarm		
	GAIN	GAIN		
	HYS	Hysteresis		
	LMNDN_OP		Stop	Close
	LMNR_IN	OUT		
	LMNUP_OP		Stop	Open
	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_AL		Suppress LL=No	Suppress LL=Yes
	M_SUP_ER		Enable ER Alarm	Suppr. ER Alarm
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	M_SUP_WL		Suppress L=No	Suppress L=Yes
	MAN_HLM	MAN high limit		
	MAN_LLM	MAN low limit		
	MAN_OP	MAN		
	MO_PVHR	Bar HL		
	MO_PVLR	Bar LL		
	MTR_TM	Motor time		
	OOS		In Service	Out of Service
	OPTI_EN		Disable Optimiz.	Enable Optimiz.
	PULSE_TM	Pulse time		
	PV_IN	PV		
	PVH_ALM	PV: HH alarm		
	PVH_WRN	PV: H alarm		
	PVL_ALM	PV: LL alarm		
	PVL_WRN	PV: L alarm		
	RESET		Do Nothing	Reset QMSS_ST
	SP_HLM	SP high limit		
	SP_LLM	SP low limit		
	SP_OP	SP		
	SP_TRK_ON		No Tracking	Track SP:= PV
	SPBUMPON		SP may bump	SP bumpless
	SPDRLM	Neg. ramp		
	SPEXTSEL_OP		SP= Internal	SP= External
	SPRAMPOF		Ascent limit=On	Ascent limit=Off
	SPURLM	Pos. ramp		
	TM_LAG	Lag time		
	TN	TI		
	TV	TD		

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
DIG_MON	I		Off	On
	SUPPTIME	Suppress time		
	OOS		In Service	Out of Service
DOSE	ACK_TOL_OP		0	Acknowl.
	CANCEL_OP		0	Cancel
	COMP_CHG		Comp. change=Off	Comp. change=On
	DRIB_COR		Dribb. corr.=Off	Dribb. corr.=On
	DRIBB	Dribbling init.		
	DRIBBMAX	Max. dribbling		
	M_SUP_1		Suppr normal =No	Suppr normal=Yes
	M_SUP_2		Suppr over =No	Suppr over =Yes
	M_SUP_3		Suppr under =No	Suppr under =Yes
	MO_PVHR	Bar UL		
	MO_PVLR	Bar LL		
	OOS		In Service	Out of Service
	PAUSE_OP		Process=Continue	Process=Pause
	PDOS_TME	Postdose time		
	POSTDOSE		0	Postdose
	PV_IN	PV		
	RELAXTME	Relax time		
	REVERSE		Reverse=No	Reverse=Yes
	SP_HLM	SP high limit		
	SP_LLM	SP low limit		
	SP_OP	Setpoint		
	SPBUMPON		SP may bump	SP bumpless
	SPEXTSEL_OP		SP= Internal	SP= External
	START_OP		0	Dose=Start
	TOL_N	Lower tol. band		
	TOL_P	Upper tol. band		
ELAP_CNT	HOURS	Hours		
	HOURS_AH	HH alarm		
	HOURS_OP	Preset value		
	HOURS_WH	H alarm		
	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	MO_HOUHR	Bar UL		
	MO_HOULR	Bar LL		
	OOS		In Service	Out of Service
	TRACK_OP		0	Preset

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
FMCS_PID	AUT_ON_OP		Mode= Manual	Mode= Auto
	BREAK_TM	Break time		
	DEADB_W	Deadband		
	GAIN	Gain		
	H_ALM	HH alarm		
	H_WRN	H alarm		
	HYS	Hysteresis		
	L_ALM	LL alarm		
	L_WRN	L alarm		
	LMN	OUT		
	LMN_HLM	LMN high limit		
	LMN_LLM	LMN low limit		
	LMN_OP	MAN		
	LMN_SAFE	LMN safety		
	LMNDN_OP		Stop	Close
	LMNUP_OP		Stop	Open
	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_AL		Suppress LL=No	Suppress LL=Yes
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	M_SUP_WL		Suppress L=No	Suppress L=Yes
	MO_PVHR	Bar UL		
	MO_PVLR	Bar LL		
	MTR_TM	MTR time		
	OOS		In Service	Out of Service
	OP_SEL		OP operation=Off	OP operation=On
	OPTI_EN		Optim.=disable	Optim.=enable
	PULSE_TM	Pulse time		
	PV	PV		
	SDB_SEL		SDBParameter=On	SDBParameter=Off
	SP_HLM	SP high limit		
	SP_LLM	SP low limit		
	SP_OP	SP		
	SP_TRK_ON		SP track=Off	SP track=On
	SPBUMPON		SP may bump	SP bumpless
	SPEXTSEL_OP		SP= Internal	SP= External
	TD	TD		
	TI	TI		
	TM_LAG	Time lag		

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
FMT_PID	AUT_ON_OP		Mode= Manual	Mode= Auto
	BREAK_TM	Break time		
	D_F	deriv. fac.		
	DEADB_W	Deadband		
	GAIN	Gain		
	H_ALM	HH alarm		
	H_WRN	H alarm		
	HYS	Hysteresis		
	L_ALM	LL alarm		
	L_WRN	L alarm		
	LMN	OUT		
	LMN_HLM	LMN high limit		
	LMN_LLM	LMN low limit		
	LMN_OP	MAN		
	LMN_SAFE	LMN safety		
	LMNDN_OP		Stop	Close
	LMNUP_OP		Stop	Open
	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_AL		Suppress LL=No	Suppress LL=Yes
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	M_SUP_WL		Suppress L=No	Suppress L=Yes
	MO_PVHR	Bar UL		
	MO_PVLR	Bar LL		
	MTR_TM	MTR time		
	OOS		In Service	Out of Service
	PFAC_SP	Gain		
	PULSE_TM	Pulse time		
	PV	PV		
	SDB_SEL		SDBParameter=On	SDBParameter=Off
	SP_HLM	SP high limit		
	SP_LLM	SP low limit		
	SP_OP	SP		
	SP_TRK_ON		SP track=Off	SP track=On
	SPBUMPON		SP may bump	SP bumpless
	SPEXTSEL_OP		SP= Internal	SP= External
	TD	TD		
	TI	TI		

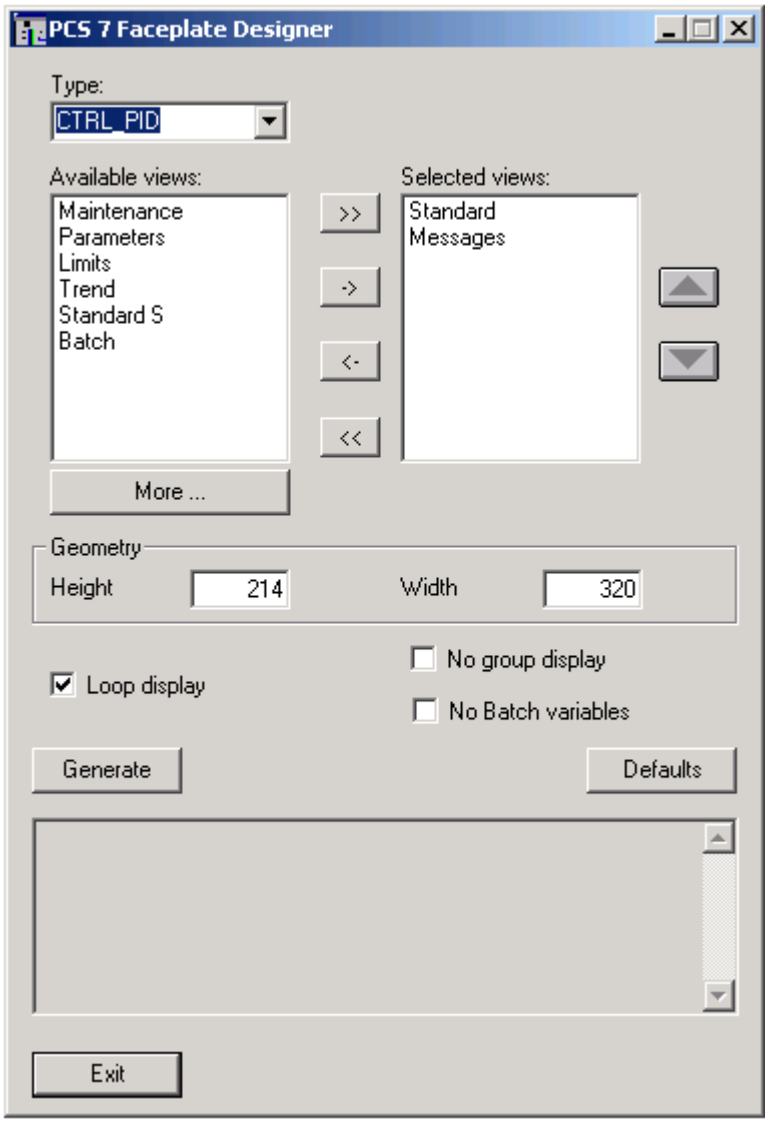
Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
INTERLOK	I1_1		0	in_1
	I1_2		0	in_2
	I1_3		0	in_3
	I1_4		0	in_4
	I1_5		0	in_5
	I2_1		0	in_6
	I2_2		0	in_7
	I2_3		0	in_8
	I2_4		0	in_9
	I2_5		0	in_10
	OVERWRITE		Overwrite=Off	Overwrite=On
MEAS_MON	HYS	Hysteresis		
	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_AL		Suppress LL=No	Suppress LL=Yes
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	M_SUP_WL		Suppress L=No	Suppress L=Yes
	MO_PVHR	Bar UL		
	MO_PVLR	Bar LL		
	OOS		In Service	Out of Service
	U	PV		
	U_AH	HH alarm		
	U_AL	LL alarm		
	U_WH	H alarm		
	U_WL	L alarm		
MOTOR	AUT_ON_OP		Mode=Manual	Mode=Auto
	MAN_ON		Motor=Stop	Motor=Start
	MONITOR		Monitoring=Off	Monitoring=On
	OOS		In Service	Out of Service
	RESET		0	Error=Reset
	TIME_MON	Mon. time		
MOT_REV	AUT_ON_OP		Mode=Manual	Mode=Auto
	FORW_ON		0	Motor=Forward
	MONITOR		Monitoring=Off	Monitoring=On
	MOT_OFF		0	Motor=Off
	OOS		In Service	Out of Service
	RESET		0	Error=Reset
	REV_ON		0	Motor=Reverse
	TIME_OFF	Mon. time off		
	TIME_ON	Mon. time on		

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
MOT_SPED	AUT_ON_OP		Mode=Manual	Mode=Auto
	MONITOR		Monitoring=Off	Monitoring=On
	MOT_OFF		0	Motor=Off
	OOS		In Service	Out of Service
	RESET		0	Error=Reset
	SP1_ON		0	Motor=Speed 1
	SP2_ON		0	Motor=Speed 2
	TIME_MON	Mon. time		
OP_A	BTRACK		Bumpless=Off	Bumpless=On
	U	U		
OP_A_LIM	BTRACK		Bumpless=Off	Bumpless=On
	U	U		
OP_A_RJC	BTRACK		Bumpless=Off	Bumpless=On
	U	U		
OP_D	BTRACK		Bumpless=Off	Bumpless=On
	I0		Off	On
OP_D3	BTRACK		Bumpless=Off	Bumpless=On
	I1		0	Switch 1
	I2		0	Switch 2
	I3		0	Switch 3
OP_TRIG	I0		0	Reset
RATIO_P	IN_EX		Internal	External
	MO_U1HR	Bar UL		
	MO_U1LR	Bar LL		
	U1	U1		
	U2	U2		
	U2_HL	High limit U2		
	U2_LL	Low limit U2		
	V_HL	High limit V		
	V_LL	Low limit V		
SWIT_CNT	M_SUP_AH		Suppress HH=No	Suppress HH=Yes
	M_SUP_WH		Suppress H=No	Suppress H=Yes
	MO_VHR	Bar UL		
	MO_VLR	Bar LL		
	OOS		In Service	Out of Service
	TRACK_OP		0	Preset
	V	V		
	VAH	HH alarm		
	VTRACK_OP	Preset value		
	VWH	H alarm		

Block	Parameters	S7_shortcut	S7_string_0	S7_string_1
VALVE	AUT_ON_OP		Mode=Manual	Mode=Auto
	MAN_OC		Valve=Close	Valve=Open
	MONITOR		Monitoring=Off	Monitoring=On
	OOS		In Service	Out of Service
	RESET		0	Error=Reset
	TIME_MON	Mon. time		
VAL_MOT	AUT_ON_OP		Mode=Manual	Mode=Auto
	CLOS_VAL		0	Valve=Close
	MONITOR		Monitoring=Off	Monitoring=On
	OOS		In Service	Out of Service
	OPEN_VAL		0	Valve=Open
	RESET		0	Error=Reset
	SS_POS			
	STOP_VAL		0	Valve=Stop
	TIME_OFF	Mon. time off		
	TIME_ON	Mon. time on		

2.2 Working with Faceplate Designer

The EXE and DLL files for Faceplate Designer V6.0 are available in the folder "..\WinCC\bin\FaceplateDesigner".



Procedure

1. Open WinCC Explorer to start Faceplate Designer.
2. Enter a name for the new faceplate in the "Type" combo box.
3. You can either select a name from the drop-down list of structure types of the WinCC variable database or assign a new name.
4. In the “Selected views” pane on the right side, enter the various views of the faceplate to be generated in Faceplate Designer Select these from the "Available views" pane on the left side, or create new views by clicking "Further". Configure additional view names for output to the list of views when creating multilingual projects The program outputs a corresponding message when you generate this new view

   The procedure is described in the example (see chapter 2.2.1).
5. Configure the picture height and width of the views at the "Geometry" parameters
   The program sets the default dimensions, including the batch or message views, for example

To observe when configuring:

- The picture views are output to the group or loop display
- Globally valid pictures are used for Alarm, Batch and Trend
- Loop display generation can be suppressed. The loop display selection button is also hidden when you activate this function.
- Faceplate Designer is visualized in the language set in WinCC Explorer
- Faceplate Designer determines the user interface language currently set in WinCC and presents its dialog in the same language
- Any subsequent change of the WinCC user interface language is ignored as long as the dialog box is open
- Click "Defaults" to restore the basic settings of Faceplate Designer
- Initiate the generation of pictures by clicking "Generate" The section below shows how to generate pictures for a faceplate named "TEST" with "Selected Views = default" setting:

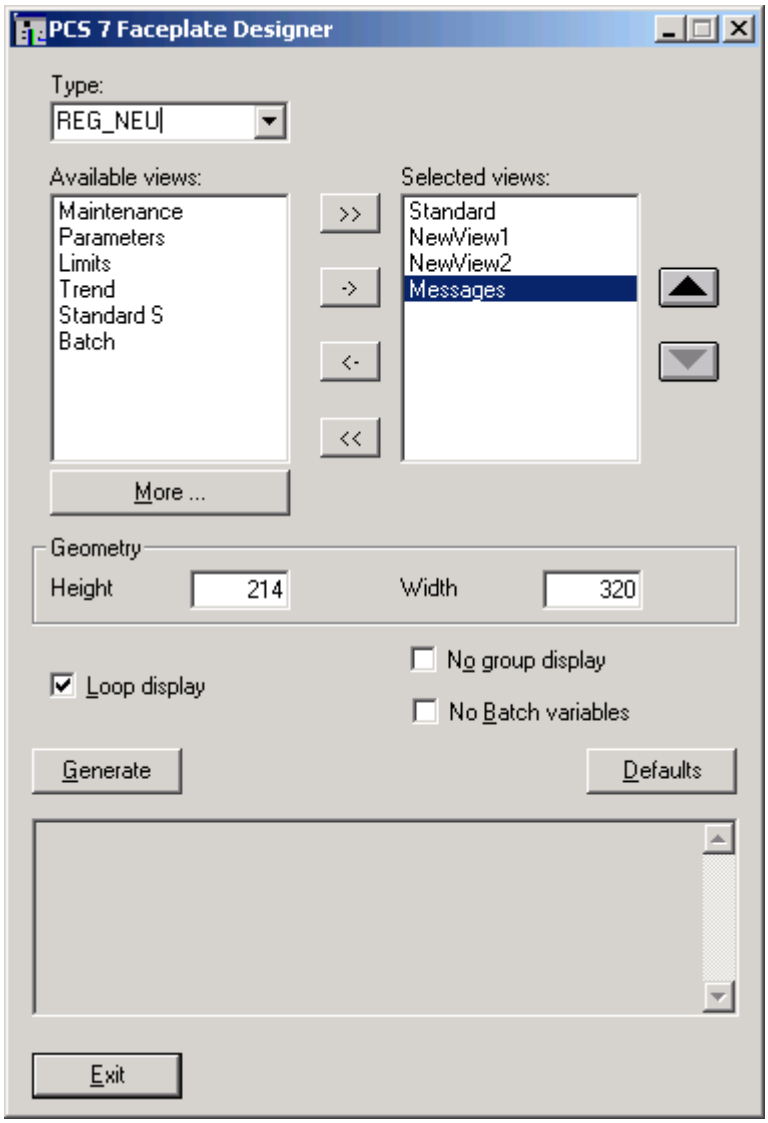
New picture	from picture template
@PG_TEST.pdl	@PG_%TYPE%.pdl
@PL_TEST.pdl	@PL_%TYPE%.pdl
@PG_TEST_OVERVIEW.pdl	@PG_%Type%_OVERVIEW.pdl
@PG_TEST_VIEWLIST.pdl	@PG_%Type%_VIEWLIST.pdl
@PG_TEST_STANDARD.pdl	@PG_%Type%_%View%.pdl

2.2.1 Example: Creating a new controller faceplate

2.2.1.1 How to create templates

Procedure

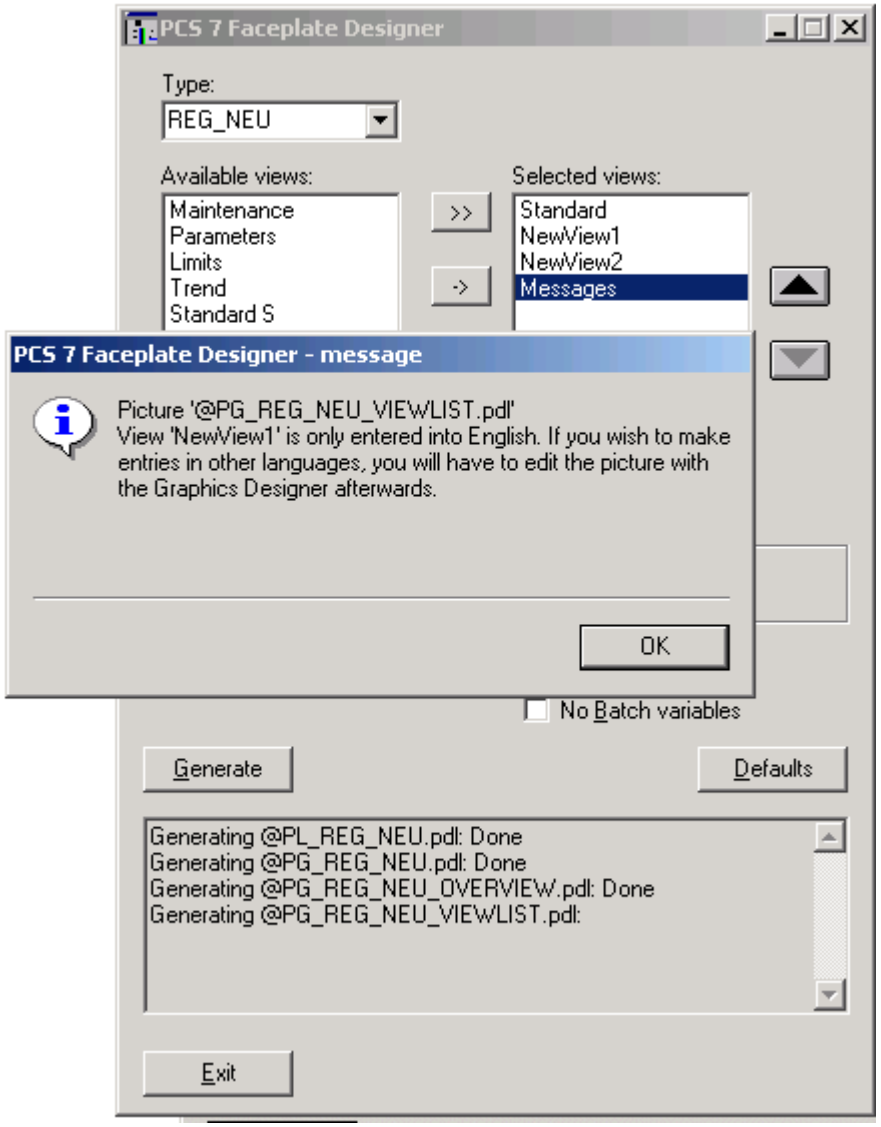
1. Open WinCC Explorer to start Faceplate Designer.
2. Enter the value "REG_NEU" in the "Type" input box
3. Click "Further…" in "Available views" and then create two new views: "NewView1" and "NewView2".
4. Select the new views and then click "->". This transfers the new views to "Selected views"
5. You can move the "Messages" view to the end of the list using the "Cursor down" button



6. Click "Generate"
   The program generates the template pictures shown below

New picture	**from picture template**
@PG_REG_NEU.pdl	@PG_%TYPE%.pdl
@PL_REG_NEU.pdl	@PL_%TYPE%.pdl
@PG_REG_NEU_OVERVIEW.pdl	@PG_%Type%_OVERVIEW.pdl
@PG_REG_NEU_VIEWLIST.pdl	@PG_%Type%_VIEWLIST.pdl
@PG_REG_NEU_STANDARD.pdl	@PG_%Type%_%View%.pdl
@PG_REG_NEU_NEUESICHT1.pdl	@PG_%Type%_%View%.pdl
@PG_REG_NEU_NEUESICHT2.pdl	@PG_%Type%_%View%.pdl

The program outputs a message concerning multilingual aspects when you generate the new views.



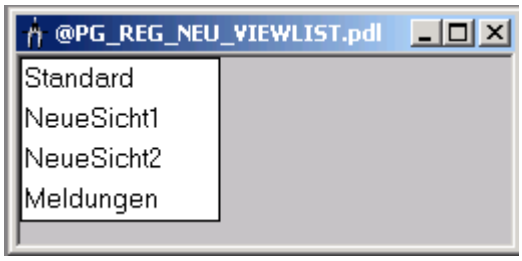
The files generated are listed in the output box at the bottom of the picture.

2.2.1.2 Editing templates

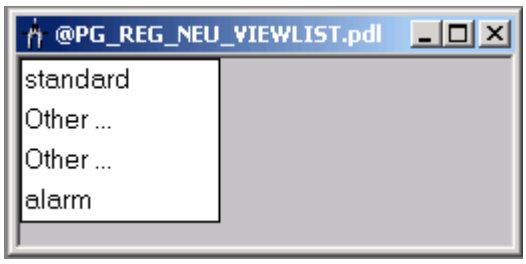
You can edit the various views after having generated the template pictures:

@PG_REG_NEU_VIEWLIST.pdl
@PG_REG_NEU_STANDARD.pdl
@PG_REG_NEU_NEUESICHT1.pdl
@PG_REG_NEU_NEUESICHT2.pdl

You only need to edit the "@PG_REG_NEU_VIEWLIST.pdl" picture if used in a multilingual system.
The example was generated in German language. Graphics Designer outputs the pictures shown below when the "German" language is set.



Graphics Designer outputs the picture shown below when you change to the English language.



Next, adapt the "Text" properties of the static texts in the object names "NeueSicht1" and "NeueSicht2" accordingly. Example: "NewView1" and "NewView2".

Do the same for the French language.

2.2.1.3 How to edit the picture template @PG_REG_NEU_STANDARD.pdl

Procedure

To edit the default faceplate of the controller:

1. Open "@PG_REG_NEU_STANDARD.pdl".
2. Delete the "@Level6" and "@Level5" objects (cf. "Configuring user rights")
3. Open the default controller faceplate "@PG_CTRL_PID" and copy all data to the "@PG_REG_NEU_STANDARD.pdl" picture

   The "@Level6" and "@Level5" objects for setting user rights and the corresponding direct connections to the control elements are included in the data copied.

Note

The program deletes the special characters from the object names of the copied data. The "@Level6" and "@Level5" objects of the "@PG_REG_NEU_STANDARD.pdl" pictures are therefore initially named "Level6" and "Level5". You must restore the original names, because the scripts can only provide values to these objects.

In the next step, you can edit, add or delete picture objects.

Note that the deleted objects may still receive or transfer data by means of direct connection. Refer to "Documentation of the default faceplates". This section lists all direct connection sequencers and objects which transfer data by means of direct connection. Objects usually included:

- "@Level6" and "@Level5" for the transfer of user rights
- The "Format" object for the transfer of instance-specific number formats (cf. the description of basic elements, chapter 2.3 et seq.)

2.2.1.4 How to edit the picture @PG_REG_NEU_NEUESICHT1.pdl

You can copy objects from the "@PCS7Elements.pdl" picture template and assign dynamic attributes to these copies.

Procedure

1. Open the "@PG_REG_NEU_NEUESICHT1.pdl" and "@PCS7Elements.pdl" pictures in WinCC Graphics Designer.
2. Select **Window > Align horizontally** to align the pictures horizontally
3. Copy the required picture objects from the "@PCS7Elements.pdl" to the "@PG_REG_NEU_NEUESICHT1.pdl" picture.
4. Assign meaningful, object-relevant object names.
5. Position the objects
6. Interconnect the dynamic attributes of the picture elements with the AS parameters
7. Configure the "User rights sequencers" based on the "@Level5" and "@Level6" objects
8. Save the picture

2.2.1.5 Dynamic update of faceplates

There are several methods of updating faceplates dynamically:

- The extension of the variable required is known

  Open the object properties dialog to assign dynamic attributes to an object such as a bar graph. In the "Dynamics" column of the properties dialog box, double-click the bulb icon of the attribute required. On the input box, you can now enter the dot plus extension. Example: .PV_IN.

- Variable from the variable list

  The variable list is usually deployed for the configuration of process pictures. However, this list returns all variables. Right-click the glow lamp icon on the properties dialog box and then select "Variable".

  Locate the relevant variable and then double-click this entry.
  As the dynamic attribute contains the full variable name, delete the text leading the file name extension dot.

2.2.1.6 Creating a loop view

Procedure

The "Picture selection with process tag" function lets you change to the loop view. It is advisable for this reason to generate a loop view, regardless of whether you only require a single view for the faceplate.

1. Generate the pictures without loop view in Faceplate Designer.
   The program generates the group picture view without loop view selection button.
2. Repeat generation and include the loop display view Click "No" for all pictures, except when prompted to "Overwrite loop display".

2.2.1.7 Generating an additional view

Procedure

Recommended procedure for generating an additional view after having edited the existing views:

1. Enter the type name and the selected views in Faceplate Designer similar to the initial generation
2. Add the new view to the entries and then start generation

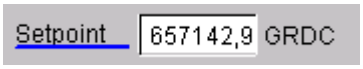
   During generation, the program outputs a message asking you to confirm overwriting of any existing file.
3. Acknowledge this message with "No"

2.3 Basic elements

2.3.1 Storage location of the basic elements

All basic elements are saved to the "@PCS7Elements.pdl" picture template. The picture is saved to the ”\Wincc\options\pdl\FaceplateDesigner_V6" folder and copied to the project by OS Project Editor.

2.3.2 Display and control of analog values



Object type	Object name	Picture name
PCS7_AnalogValue	PCS7_AnalogValue1 PCS7_AnalogValue2 PCS7_AnalogValue3	@PCS7Elements.pdl

Example of parameter settings at the identical "PCS7_AnalogValue1" and "PCS7_AnalogValue2" objects:

- "PCS7_AnalogValue1" for analog value input
- "PCS7_AnalogValue2" for analog value display

The floating-point format of the I/O field is used at both objects. You can use these objects for numerical representation and input functions which are not modified by the process, as the floating point function does not have a negative impact.

It is recommended to use the "PCS7_AnalogValue3" object which was created using the new AdvancedAnalogDisplay function. With this function, only the integer digits float, whereas the decimal places can be configured instance-specific.

Settings to make when using the function only for analog displays:

- Set the "Operator input enable" property to FALSE state
- Set the value "gray" at the "Background color" property

When used for analog value input, the program calls the "PCS7_OpenInputBoxAnalog_V6" script on mouse click.

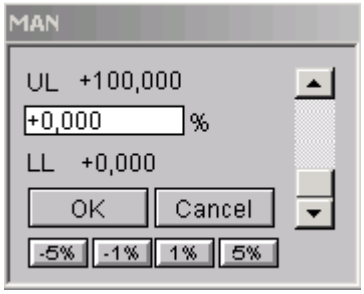
Operator control picture "@PCS7_BedAnalog.pdl"

The operator control picture "@PCS7_BedAnalog.pdl" is called using the script transfer parameter

CallFrom = 0

"PCS7_OpenInputBoxAnalog_V6(lpszPictureName,lpszObjectName,0);"

This control picture contains a vertical scroll bar for percentage adjustment and is designed for analog value input with limits.



Operator control picture "@PCS7_BedAnalog_NL.pdl"

The "@PCS7_BedAnalog_NL.pdl" operator control picture is called using the script transfer parameter

"CallFrom = 1"

"PCS7_OpenInputBoxAnalog_V6(lpszPictureName,lpszObjectName,1);"

This operator control picture does not contain a scroll bar and is designed for analog value input without limits.

In order to directly transfer any change of a process-controlled operator input enable signal to the operator control picture, you can call the scripts listed below in the "operator input enable" property of the "PCS7_AnalogValue" objects.

- "PCS7_OpenInputBoxAnalog_V6(lpszPictureName,lpszObjectName,10);" for the operator control picture with limits
- "PCS7_OpenInputBoxAnalog_V6(lpszPictureName,lpszObjectName,11);" for the operator control picture without limits

You cannot edit the value shown in the operator control picture if operator input is disabled when you select the picture.

Properties	**Function**
ProcessValue/OutputValue	Structure element of the controlled analog value
ProcessValue/VisibleValue	Structure element of the dynamically updated analog value
Limits/UpperLimit	Structure element for the "high" limit of analog value input
Limits/LowerLimit	Structure element for the “low” limit of analog value input
Other/OP_enabled	Input enable on AS side, for example "Q_SP_OP" or permanently set to "No" if only used for display functions
Other/Display_Analog_Value	Must always be set visible
Other/Password	Do not use. This item is handled by the access control functions.
Other/Display_Line	Display of the blue line
Other/Line thickness	You can adjust the line thickness
Other/Open_InpBox_from_Bar	Properties for the indirect call of operator input picture "@PCS7_BedAnalog.pdl", for example, using a control bar function
Font/Text	Labeling of the I/O field (setpoint)
Font/Unit	Unit of the analog value, dynamically set at .MEMBER#unit, for example, .SP_OP#unit
Font/X-Alignment_Text	left aligned if several I/O boxes are arranged vertically right aligned for single analog values
Colors/Fontcolor	Font color selection
Colors /Linecolor	Line color selection
Colors /Background_Value	Selection of the background color "Value". Updated dynamically by the script upon "Change of operator input enable“ events
Colors /Fontcolor_Value	Selection of the font color "Value".
Geometry/Width_Analogvalue	Overall width of the analog field
Geometry/Width_Line_Text	The length of the line and text can be set
Geometry/PositionX1_Line_Text	Must be adapted when the text and line length change
Geometry/PositionY1_Line	Line height compared to the font

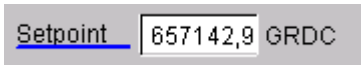
The "Font/Text" property is set by default at sample parameter ".SP_OP#shortcut". The display text of the block icon and the header of the picture for analog value input, are read from the AS (s7_shortcut). When using variables without display text, for example, PV_IN, delete the interconnection and configure the text directly in WinCC. If necessary, generate the text in three languages.

The program also calls the "PCS7_OpenInputBoxAnalog_V6" script when it detects a change to the "Open_BedBox_from_Bar" property. The program verifies that operator input is enabled before it executes the script.

The script can also be used for indirect input. Example: the program calls the corresponding control picture when it detects the "Click on setpoint bar graph" event. (cf. the description of the double bar graph which displays both the setpoint and the process value). A change to the property is there diverted to the “Open_InpBox_from_Bar” property by means of direct connection.

2.3.3 Visualization of analog values using the "AdvancedAnalogDisplay"

Properties



Object type	Object name	Picture name
PCS7_AnalogValue	PCS7_AnalogValue3	@PCS7Elements.pdl

The number format of the AdvancedAnalogDisplay is available for applications in which the floating-point format, in particular for decimal places, is not desirable. The function supports the instance-specific definition of the number format by means of the block icon.
See chapter 2.1.7, "Configuring number formats".

The description of the objects in the user object and the property function is the same as in chapter 2.3.1.
An additional "Format" property is available. The number format is controlled by means of direct connection if instance-specific number formats are required.

2.3.4 Static text

Properties

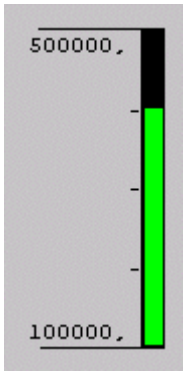
Static texts are used, for example, to label check boxes and I/O buttons.

Format: Arial character set, font size 12

Object type	Object name	Picture name
PCS7_StaticText	StaticText	@PCS7Elements.pdl

2.3.5 Standard bar graph for analog values

Properties



Object type	Object name	Picture name
PCS7_BarStandard_1	BarStandard_1	@PCS7Elements.pdl

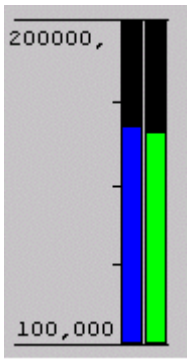
Properties	Function
Links/PV	Structure element of the analog value output to a dynamic bar graph
Links/Range_LL	Structure element for "Bar graph low limit" (Measurement start value)
Links/Range_UL	Structure element for "Bar graph high limit" (measurement end value)
Other/PVunderLimit	Display of measuring range undershoot The process value may not be edited by the user.
Other/PVoverLimit	Display of measuring range overshoot The process value may not be edited by the user.
Colors/Barcolor_PV	Color of the bar graph

The scripts (called of the script "PCS7_UpdateBar_V6.fct") available at each of the interconnected PV, RANGE_LL, RANGE_UL properties output an arrow at the bar limits to indicate whether a change to values has caused an overshoot of process value limits.

2.3.6 Double bar graph for analog values

Properties

The double bar graph is used for simultaneous visualization of setpoints and actual values.



Object type	Object name	Picture name
PCS7_BarStandard_2	BarStandard_2	@PCS7Elements.pdl

Properties	Function
Links/PV	Structure element of the process value which is output to a dynamic bar graph.
Links/SP	Structure element of the setpoint which is output to a dynamic bar graph
Links/Range_LL	Structure element for "Bar graph low limit" (Measurement start value)
Links/Range_UL	Structure element for "Bar graph high limit" (measurement end value)
Other/SPunderLimit	Display of measuring range undershoot The setpoint may not be edited by the user.
Other/PVunderLimit	Display of measuring range undershoot The process value may not be edited by the user.
Other/SpoverLimit	Display of measuring range overshoot The setpoint may not be edited by the user.
Other/PVoverLimit	Display of measuring range overshoot The process value may not be edited by the user.
Colors/ Barcolor_SP	Bar graph color for the setpoint
Colors/Barcolor_PV	Bar graph color for the process value

When operator input enable = TRUE at the bar graph and you click the graph, the script briefly cycles the operator input enable status from "FALSE“ > "TRUE" > "FALSE.

The "operator input enable" property can then be transferred to the corresponding basic element "PCS7_AnalogValue" (property "Open_BedBox_from_Bar“) by

means of direct connection, were it initiates the call of the analog value input box for setpoint input (see also the description of analog value input in chapter 2.3.1).

The bar graph display is supplemented by arrows which indicate values above and below bar graph limits.

The scripts (call of the script "PCS7_UpdateBar.fct") stored in each one of the interconnected properties PV, SP, RANGE_LL and RANGE_UL output arrows at the bar graph limits to indicate any measuring range overshoot/undershoot when values change.

2.3.7 Horizontal bar graph

Properties

The horizontal bar graph can be used, for example, to visualize manipulated variables.

Object type	Object name	Picture name
PCS7_BarStandard_3	BarStandard_3	@PCS7Elements.pdl

The "operator input enable" property can be transferred to the corresponding basic element "PCS7_AnalogValue" (property "Open_InpBox_from_Bar“) by means of direct connection, were it initiates the call of the analog value input box for setpoint input (see also the description of analog value input in chapter 2.3.1).

The bar graph display is supplemented by arrows which indicate values above and below bar graph limits.

Properties	Function
Other/Barcolor	Color of the bar graph
Other/PVunderLimit	Display of measuring range undershoot The process value may not be edited by the user.
Other/PVoverLimit	Display of measuring range overshoot The process value may not be edited by the user.
Other/Unit	Unit of the manipulated variable
Links/RANGE_LL	Start of the measuring range of the bar graph display
Links/50PVALUE	50%-display is calculated by a script when RANGE_LL or RANGE_UL changes.
Links/RANGE_UL	End of the measuring range of the bar graph display.
Links/PV	Structure element of the manipulated variable which is output to a dynamical bar graph

2.3.8 "Limit value display" bar graph

Properties

Object type	Object name	Picture name
PCS7_BarLimits	BarLimits	@PCS7Elements.pdl

Properties	Bar graph property	Function
Limits/RANGE_UL	Maximum value and process connection	End of the bar graph measuring range (.MO_PVHR
Limits/RANGE_LL	Minimum value, zero value and high limit RH5	Start of the bar graph measuring range (.MO_PVLR)
Limits/VALUE_AH	High limit AH	"Alarm high" limits display (.PVH_ALM)
Limits/VALUE_WH	High limit WH	"Warning high" limits display (.PVH_WRN)
Limits/VALUE_WL	Low limit WL	"Warning low" limits display (.PVL_WRN)
Limits/VALUE_AL	Low limit AL	"Alarm low" limits display (.PVL_ALM)
Limits/@HighLimitTH	High limit TH	Controls the low limit of the second to last segment This property is only visible in the configuration dialog.
Limits/@HighLimitRH4	High limit RH4	Controls the low limit of the last segment This property is only visible in the configuration dialog.
Limits/@ Bar_graph_colorRH4	Bar graph color RH4	Defines the color of the second to last lower segment This property is only visible in the configuration dialog.
Limits/@ Bar_graph_color RH5	Bar graph color RH5	Defines the color of the last lower segment This property is only visible in the configuration dialog.
Colors/ColorAlarm	Bar graph color AH	

Properties	Bar graph property	Function
Colors/ColorWarning	Bar graph color WH	
Colors/ ColorBackground	Bar graph color TH	Color of the middle segment

The script "PCS7_UpdateBarLimits_V6" is called when the low limit values "VALUE_WL", "VALUE_AL" and "RANGE_LL" change, as the "Alarm" and "Low Limit Warning " bar graph display cannot be generated by means of the standard bar graph. A script is not required for the high limit values.

2.3.9 "Message suppression" display

Properties

Object type	Object name	Picture name
PCS7_MSG_LOCK	MSG_LOCK	@PCS7Elements.pdl

Properties	Function
Userdefined2/ actual status	"Statusdisplay2" control Messages with a diagonal strike-out disable requests from the AS (.MSG_LOCK) 
Userdefined2/ actual status1	Statusdisplay3" control Messages with a double diagonal strike-out are disabled Response from WinCC (.QMSG_SUP) 
Userdefined2/ Display1	"Status display3" is shown and overlays "Status display2" (.QMSG_LOCK)

2.3.10 "Batch Occupied" display

Properties

Object type	Object name	Picture name
PCS7_OCCUPIED	OCCUPIED	@PCS7Elements.pdl

Properties	Function
Userdefined2/ actual status	Control of status display 1 / Indicates that a block is occupied by a batch. Structure element (.OCCUPIED)

2.3.11 Acknowledgment of messages from the selected block

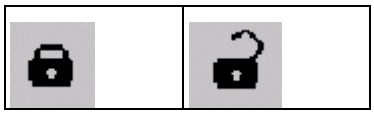
Properties

Object type	Object name	Picture name
Button	ButtonQS	@PCS7Elements.pdl

The button for group acknowledgment of messages corresponds with the button of the standard button set "@Buttons11.pdl", however, with a different script for instance-specific message acknowledgment. Group acknowledgment only functions in combination with a group display.

2.3.12 "Locked" display block (valve, motor)

Properties



Object type	Object name	Picture name
StatusDisplay	Lock	@PCS7Elements.pdl

Properties	Function
Status/actual status	Indicates whether a block is locked Structure element (.LOCK)

2.3.13 Group display

Properties

Object type	Object name	Picture name
Group display	EventState	@PCS7Elements.pdl

Properties	Function
Other/CollectValue	Display of alarm and warning states Structure element (.EventState)

2.3.14 Binary value input using "Check Box_R"

Properties

 	
	@PCS7_BedCheck.pdl

Object type	Object name	Picture name
CHECKBOX_R	Checkbox_R1	@PCS7Elements.pdl

The "@PCS7_BedCheck.pdl" check box is called by the "PCS7_OpenCheckbox_V6" script.

Properties	Function
Other/ DisplayActivWith	DisplayActivWith = 1 → The value 'TRUE' is written to the binary variable when the check box is set. DisplayActivWith = 0 → The value 'FALSE' is written to the binary variable when the check box is set.
Other/OP_enabled	Enables operator input at the check box
Interconnection/Input	Control picture title of the "@PCS7_BedCheck.pdl" check box
Interconnection/Variable	Interconnection with the binary structure element, for example (.MSG_LOCK)
Interconnection/NegatedVariable	Check box that is clicked; may not be modified by the user
Interconnection/Read_Text_From_AS	Text is read from "String_0" or "String_1" and assigned to the "Input" property.
Interconnection/CaptionCheckBoxOn	YES = The text of "Input" is displayed on the right side of the check box NO = The check box text is not displayed if insufficient space is available

You select the internal option “Inverted Variable” clicking on the check box. The status of the binary variable to be controlled is determined and written back to "Inverted Variable" ("Interconnection/NegatedVariable" property). When the "Interconnection/Variable” property changes and a picture is selected, a script is executed to update the display of the "NegatedVariable" (see also the Check_Box flow chart). The "Interconnection/Variable” property must be set by the configuration to "unequal 1“ and "unequal 0“ (0x8) to ensure that the script is always executed when a picture is selected.

The texts used to label the check boxes are read from parameter attributes "String_0" and "String_1" of the block instance.

Labeling of the check box

Rules of check box labeling:

- When you set "Read_Text_From_AS" = 1 and "DisplayActivWith = 1", the program outputs the entire text of "String_1" on the right side of the check box
- When "DisplayActivWith = 0", the entire text of "String_0" is output on the right side of the check box
- When property "Read_Text_From_AS" = 0, the program outputs the text configured at "Input" You must set these states in order to display output parameters, as a "String_0" or "String_1" does not exist at this function and you would therefore generate scripting errors You also have to make sure that you do not enable the check box for operator input in this case

Rules of check box labeling:

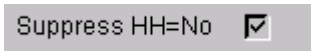
- When the text in "String_0" and "String_1" contains a "=“ character, the string text on the right side of the "=“ character is used to label the check boxes
- If the text of the strings does not contain a "=“ character the full text is used to label the check boxes

Rules for the control picture title:

- If the text of the "String_0" and "String_1" contains a "=“ character, the text to the left of the "=“ character forms the title of the input box, that is, when "DisplayActivWith = 1" at "String_1" and "DisplayActivWith = 0" at "String_0"
- If the text of the strings does not contain a "=“ character, the check box labeling text is used

2.3.15 Binary value control using "Check Box_L"

Properties



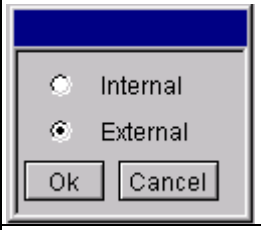
The functionality corresponds with binary value control using "CheckBox_R", however, with text display on the left side.

Although the text is not displayed, both variants (right or left aligned text) are still required, depending on whether there is a further control element positioned on the left or right side of the check box, for example, for the alarm limits of MEAS_MON.

For information on properties and functions, see chapter 2.3.14.

2.3.16 Binary value control using a combo box

Properties

	
	@PCS7_BedCombo.pdl

Object type	Object name	Picture name
PCS7_COMBOBOX	COMBOBOX1	@PCS7Elements.pdl

The "@PCS7_BedCombo.pdl" combo box is called by the script "PCS7_OpenComboBox_V6.fct".

The texts are read from "String_0" and "String_1".

Properties	Function
Colors/BackColor_Text1	Background color Text1
Colors/BackColor_Text2	Background color Text2
Font/Text1	Display Text1 (read from AS)
Font/Text2	Display Text2 (read from AS)
Displays/Display_Text1	Display Text1 (controls which value is selected in the display)
Displays/Display_Text2	Display Text2 (controls which value is selected in the display)
Other/ OP_enabled_Text1	Enables input of Text1
Other/ OP_enabled_Text2	Enables input of Text2
Other/OP_enabled	Enables the entire combo box for control using "@Level5/6"
Other/Password_Text1	User rights for Text1 (not used)
Other/Password_Text2	User rights for Text2 (not used)
Links/Write_Variable1	Structure element to which selection Text1 is written
Links/Write_Variable2	Structure element to which selection Text2 is written
Links/Display_Variable1	Structure element which returns the first binary state (Text1)
Links/Display_Variable2	Structure element which returns the second binary state (Text2)
Parameters/ Write_value_Text1	Specifies which value is written to structure element "Write_Variable1“ with selection Text1 ('TRUE' or 'FALSE')

Properties	Function
Parameters/Display_Text1_with	Specifies which value ('TRUE' or 'FALSE) structure element "Display_Variable1" uses to display Text1
Parameters/ Write_value_Text2	Specifies which value is written to structure element "Write_Variable2" with selection Text2 ('TRUE' or 'FALSE')
Parameters/Display_Text2_with	Specifies which value ('TRUE' or 'FALSE) "Display_Variable2" uses to display Text2

The texts used to label the check boxes are read from parameter attributes "String_0" and "String_1" of the block instance.

- If the text of the strings contains a "=“ character, the text appended to the "=“ forms the label of the check boxes, and the text on the left side of the "=“ forms the control picture title.
- If the text of the strings does not contain a "=“ character the full text is used to label the check boxes In this case, the title bar of the control picture is filled with space characters

Information on enabling operator input

The text background in the combo box can be grayed out to indicate that operator input is disabled. This is done by transferring the "@Level5" or "@Level6" background color to "BackColor_Text1" in this object by means of one direct connection, and the "BackColor_Text1" background color to "BackColor_Text2" by means of a second direct connection. The default of both background colors must be "gray".

However, this option is only available if the various switching states of the combo box are displayed on a white background so that the access control status toggles between gray and white.

Example of "Manual/Auto" controller mode changeover:

The background color is used at the mode selection combo box "Manual/Auto" to identify the mode of operation as shown below:

- White = Manual
- Green = Auto

It is not possible for this reason to toggle the background color to gray state if user access is not enabled. The drop-down button of the combo box is therefore hidden in order to indicate this status.

Operator input enabled "Yes" 

Operator input enabled "No" 

2.3.17 Binary value control using a combo box (3ComboBox)

Properties

	
	@PCS7_3BedCombo.pdl

Object type	Object name	Picture name
PCS7_3COMBOBOX	3COMBOBOX1	@PCS7Elements.pdl

The "@PCS7_3BedCombo.pdl" combo box is called in the "PCS7_Open3ComboBox_V6.fct" script.

The texts are read from "String_0" and "String_1".

Properties	Function
Colors/BackColor_Text1	Background color Text1
Colors/BackColor_Text2	Background color Text2
Colors/BackColor_Text3	Background color Text3.
Font/Text1	Display Text1 (read from AS)
Font/Text2	Display Text2 (read from AS)
Font/Text3	Display text for Text3 (read from AS)
Displays/Display_Text1	Display text1 (controls which value is selected in the display)
Displays/Display_Text2	Display Text2 (controls which value is selected in the display)
Displays/Display_Text3	Display Text3 (controls which value is selected in the display)
Other/ OP_enabled_Text1	Enables operator input of Text1
Other/ OP_enabled_Text2	Enables operator input of Text2
Other/OP_enabled_Text3	Enables operator input of Text3.
Other/OP_enabled	Enables operator input at the entire combo box for control using "@Level5/6"
Other/Password_Text1	User rights for Text1 (not used)
Other/Password_Text2	User rights for Text2 (not used)
Other/Password_Text3	User rights for Text3 (not used)
Links/Write_Variable1	Structure element to which selection Text1 is written

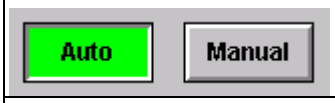
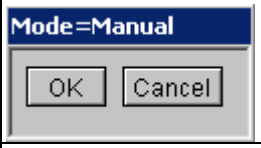
Properties	Function
Links/Write_Variable2	Structure element to which selection Text2 is written
Links/Write_Variable3	Structure element to which selection Text3 is written
Links/Display_Variable1	Structure element which returns the first binary state (Text1)
Links/Display_Variable2	Structure element which returns the second binary state (Text2)
Links/Display_Variable3	Structure element which returns the second binary state (Text3)
Parameters/ Write_value_Text1	Specifies which value is written to structure element "Write_Variable1“ with selection Text1 ('TRUE' or 'FALSE')
Parameters/Display_Text1_with	Specifies which value ('TRUE' or 'FALSE') "Display_Variable" uses to display Text1
Parameters/ Write_value_Text2	Specifies which value is written to structure element "Write_Variable2" with selection Text2 ('TRUE' or 'FALSE')
Parameters/Display_Text2_with	Specifies which value ('TRUE' or 'FALSE) "Display_Variable" uses to display Text2
Parameters/ Write_value_Text3	Specifies which value is written to structure element "Write_Variable3“ with selection Text3 ('TRUE' or 'FALSE')
Parameters/Display_Text3_with	Specifies which value ('TRUE' or 'FALSE') "Display_Variable" uses to display Text3

The texts used to label the check boxes are read from parameter attributes "String_0" and "String_1" of the block instance.

- If the text of the strings contains a "=” character, the text appended to the "=“ forms the label of the check boxes, and the text on the left side of the "=“ forms the control picture title.
- If the text of the strings does not contain a "=“ character the full text is used to label the check boxes In this case, the title bar of the control picture is filled with space characters

2.3.18 Binary value control with button and color change

Properties

	
	@PCS7_BedBinaer.pdl

Object type	Object name	Picture name
PCS7_BinOp	BinOp0 / BinOp1	@PCS7Elements.pdl

The "CMD2Steps" parameter can be used to configure single- or double-button control of binary values.

- CMD2Steps = Yes
  The "PCS7_OpenInputBoxBin_V6.fct" script calls the "@PCS7_BedBinaer.pdl" picture for "Auto" or "Manual" mode selection. Click "OK" in this picture to write the value defined at "Write_Value" to the variable interconnected with "Write_Variable"
- CMD2Steps = No
  The value defined at "Write_Value" is written directly to the variable interconnected "Write_Variable" when you click STOP or RUN

The texts used to label the buttons are read from parameter attributes "String_0" and "String_1" of the block instance.

- If the text of the strings contains a "=“ character, the text after the "=“ forms the label of the buttons, whereas the full text is used to form the title of the control picture.
- If the text of the strings does not contain a "=“ character the full text is used to label the buttons

Properties	Function
Colors/Button_Colour	Background color for text if active and input is disabled
Other/OP_enabled	Input enable
Other/DisplayActive	Displays "Button On" property Do not change, as controlled by script
Links/Write_Variable	Structured element to which the selection text is written
Links/Display_Variable	Structure element which indicates the first binary state (Text)

Properties	Function
Parameters/Write_value	Defines which value is written to structure element "Write_Variable“ with selection Text ('TRUE' or 'FALSE')
Parameters/ Display_is_active_with	Defines which value ('TRUE' or 'FALSE') "Display_Variable" uses to indicate the text in the selected color (display active and input disabled)
Parameters/ButtonText	The display text may not be modified, as controlled by script
Parameters/CMD2Steps	1- or 2-button control

2.3.19 Binary value input using buttons

Properties

	
	@PCS7_BedBinär.pdl

Object type	Object name	Picture name
PCS7_ButtonBit	ButtonBit	@PCS7Elements.pdl

The function corresponds with the description in chapter 2.3.18. Differences:

- No color change
- The button always indicates input enabled mode (no indication of "Button On“)

The "CMD2Steps" parameter can be used to define single- or two-button control of binary values.

- CMD2Steps = Yes
  When the operator selects "Reset", the "PCS7_openinputboxbin_V6.fct" script calls the "@PCS7_BedBinär.pdl" picture You can write the value defined at "Write_Value" to the variable interconnected with "Write_Variable" by clicking "OK" in this picture
- CMD2Steps = No
  You write the value defined at "Write_Value" directly to the variable interconnected with "Write_Variable" by clicking "Reset"

2.3.20 Status display with two alternatives

Properties

Object type	Object name	Picture name
PCS7_Status_2_Alternative	Status_2_Alternative	@PCS7Elements.pdl

Properties	Function
Links/Link	Interconnection with the binary structure element, for example (.MSG_LOCK)
Others/ Read_Text_From_AS	Text fetched from the AS ("String_0" and "String_1") for labeling the status display
Other/Display	May not be changed by the user and must remain 'TRUE'.
Other/OP_enabled	Input enable
Font/Text_On	Description of the 'True' status
Font/Text_Off	Description of the 'FALSE' status
Colors/BackColor_OFF	Background color for the 'Off' status
Colors/BackColor_ON	Background color for the 'On' status
Colors/TextColor_OFF	Text color for the 'Off' status
Colors/TextColor_ON	Text color for the 'On' status
Displays/Off	Displays static text "T_off" May not be edited by users, as controlled by script
Displays/On	Displays static text "T_on" May not be edited by users, as controlled by script

The "PCS7_2Stati_Variable_Changed_V6.fct" script is called when the variable interconnected with the "Links/Link" property changes.

This script controls the display of "T_off" and "T_on" based on the status at "Links/Link".

The status texts can be read from the AS (Read_Text_From_AS = TRUE) by setting the link to an input parameter such as AUT_ON_OP. Usually "String_0" or "String_1" do not exist at the output parameters. In this case (Read_Text_From_AS = FALSE), save the text directly to the object (Text_On, Text_Off).

2.3.21 Status display with n alternatives

Properties

Object type	Object name	Picture name
PCS7_Status_1_v_n	Status_1_v_n	@PCS7Elements.pdl

Properties	Function
Links/Link	Interconnection with the binary structure element (.MSG_LOCK)
Others/ Read_Text_From_AS	"Text_On" label for the status display, read from the AS (String_1).
Other/Display	May not be modified by the user, as controlled by script
Other/OP_enabled	Input enable
Font/Text_On	Description of the 'True' status
Colors/BackColor_ON	Background color for the 'On' status
Colors/TextColor_ON	Text color for the 'On' status
Masks/ Mask	Value used to control visibility of the text box

For status displays with n options, the number of alternatives required determines the number of objects of the type **Status_1_v_n** to be arranged in an overlay stack.

The "PCS7_1vnStati_Variable_Changed_V6.fct" script is called when the variable which is interconnected with the "Links/Link" property changes.

You can define the value to be used to display the relevant object using the "Masks/Mask" property. This option is suitable for alternative control using INTEGER or REAL values, for example.

Set the value in "Mask" to 1 for all objects of an alternative control of multiple binary values. You can set the priority for all active binary values in the "Level“ property. WinCC supports levels 0 to 15, also in ascending order of priority.

Example

Of two objects, one is assigned to level 4 and the other to level 5. Both objects are set visible and arranged in an overlay stack. The level 5 object is visible and the level 4 object remains hidden.

The status text can be read from the AS (Read_Text_From_AS = TRUE) by setting the link to an input parameter such as REV_ON. The output parameters usually do not contain "String_1". In this case (Read_Text_From_AS = FALSE), save the text directly to the object.

2.3.22 "Valve" status display

Properties

The valve status display shown below was derived from PCS 7 V5.

As of PCS 7 V6.x, it is advisable to use the “Extended Status Display” function to implement the status displays. Refer to the WinCC process control options.

Object type	Object name	Picture name
PCS7_Valve_Stat	Valve_Stat1, Valve_Stat0, Valve_Stat2	@PCS7Elements.pdl

Properties	Function
Other/OP_enabled	Operator input enable
Other/Display	Displays the user object
Link/VariableLink	Interconnection to the structured element if the states are controlled using REAL or INTEGER values
State/Index	Manual setting of the status display for binary control using "State/Display".
State/Display	Control of states using binary variables

The user object "Valve_Stat" can be used in two ways.

- The object is used as standard status display
  The states are controlled using the "Link/VariableLink" property "State/Display" must be set to "Yes". The program supports the three states mentioned above. However, this is only possible if the valve states are available in a variable Usually, this is not the case
- A "Valve_Stat" object was created for each of the three states and these objects were arranged in an overlay stack
  The status to be visualized is set at "State/Index" The link to the corresponding structure element is set in "State/Display" This variant is used for the VALVE faceplate

2.3.23 "Motor" status display

Properties

Object type	Object name	Picture name
StatusDisplay	Motor	@PCS7Elements.pdl

Standard status display; with two alternatives and control by means of the "Status/ActualStatus" property.

2.3.24 Configuring permissions

Properties

Object type	Object name	Picture name
Permission	Permission_Setpoint	@PCS7Elements.pdl

The "Permission" object is designed for creating global permissions for a controllable "Setpoint" element.

Certain controllable elements are subject to different procedures for the verification of user rights.

Example:

- "Setpoint" input is subject to access control (using "@Level5" or "@Level6") by user administration in WinCC. This check must be performed when a new user logs in.
- "Setpoint" input is also subject to control by an AS variable (Q_SP_OP, allow only internal input of setpoint Permissions are verified when the variable changes

At the FMCS_PID, the QPARF parameter of the AS is also called for the verification of permissions.

Procedure

To configure permissions:

1. Create a direct connection of "@Level5" or "@Level6", "Enable input" property to the "Permission" object, "Level_Source" property.
2. C script called when the "Level_Source" property changes:

```
BOOL bTag1 =!GetTagBitWait(".QPARF");
BOOL bTag2 =GetTagBitWait(".Q_SP_OP");
if (bTag1 &&  bTag2 && value)
{
  SetPropBOOL(lpszPictureName,lpszObjectName,"Target_OP_Enable",TRUE);

SetPropWord(lpszPictureName,lpszObjectName,"Target_BackgroundColor",CO_WHITE);
}
else
{
   SetPropBOOL(lpszPictureName,lpszObjectName,"Target_Permission",FALSE);
   SetPropWord(lpszPictureName,lpszObjectName,"Target_BackgroundColor
",CO_LTGRAY);
}
SetPropBOOL(lpszPictureName,lpszObjectName,"Level_Target",value);
```

This script is called when a new user logs in or a picture has been selected.

The AS variables which are included in the verification of permissions must be checked at the same time. In this case, check the "QPARF" and "Q_SP_OP" variables.

The program sets the following values if all three criteria have been met:

- Property "TARGET_OP_ENABLE" = 'TRUE'
- The value at property "TARGET_BackgroundColor" is set to "white"

The value of property "Level_Source" is transferred to property "Level_Target".

"Level_Target“ is defined for the interconnection of the direct connections to further objects.

3. C script under the "Tags" property

   This script is called by the variables included in the verification of permissions. These are the QPARF and Q_SP_OP variables.

```
BOOL bTag1 =!GetTagBitWait(".QPARF");
BOOL bTag2 =GetTagBitWait(".Q_SP_OP");
**  BOOL bLevel = GetPropBOOL(lpszPictureName,"@Level5","Operation");
if (bTag1 &&  bTag2 && bLevel)
{
  SetPropBOOL(lpszPictureName,lpszObjectName,"Target_OP_Enable",TRUE);

SetPropWord(lpszPictureName,lpszObjectName,"Target_BackgroundColor",CO_WHITE);
}
else
{
   SetPropBOOL(lpszPictureName,lpszObjectName,"Target_Permission",FALSE);
   SetPropWord(lpszPictureName,lpszObjectName,"Target_BackgroundColor
",CO_LTGRAY);
}
   return TRUE;
```

   When one of these variables is changed, these will be read from the AS. The status of "@Level5" and "@Level6" also has been verified.

   The program sets the following values if all criteria have been met:

   - Property "TARGET_OP_ENABLE" = 'TRUE'
   - The value at property "TARGET_BackgroundColor" is set to "white"

   Note: The script must also query the control "@Level" status of the direct connection.

4. Create a direct connection from the "Target_OP_Enable" to the actual object which is subject to the verification of permissions, for example, "Setpoint_AnalogValue", "Enable input" property.

   The input enable property may no longer be interconnected at this object and must be set to the value 'FALSE'.

   The BackgroundColor property must also be set to "gray" and is controlled either by the input enable function in a script, or by direct connection using the "TARGET_BackgroundColor" property of the "Permission" object.

   The "Password" property is no longer used for the “Permission” object.

5. If necessary, create an additional direct connection form the "Level_Target" property to a further "Permission" object.

2.3.25 "OpenNextFaceplate" button

Calling the corresponding INTERLOK block in a motor or valve faceplate

The "OpenNextFaceplate" is used in an open faceplate within a chart to call a further faceplate of an AS block.

A typical application is the call of the corresponding INTERLOK block in a motor or valve faceplate.

- The name of the block to be called is entered in the "blockname“ property
- The block type is entered in the usual format in the "Servername“ property, for example, "PCS7 INTERLOK Control“ for the INTERLOK block
- The variable name of the currently open faceplate is read when you click the button. The block name of the variable is then truncated and appended to the block name defined at "blockname"
- The structure element "#Comment“ exists in all blocks. It is also appended and checked for its existence in the file manager.

If it exists, the new variable name is written to the “tagname” property and the faceplate is called in the "PCS7_OpenGroupDisplay_V6“ script.

A script which is called when the "check_tag" property is changed also verifies the existence of the variable. The button is only enabled for input if the variable is available in the file manager.

In order to ensure proper execution of the script in the "check_tag“ property when a screen is selected a valid structure element whose text is different to the default text of the property must be interconnected with the "check_tag“ property. This setting allows the program to detect changes at the property. The structure element "#Comment“ which exists in all blocks is again used for this operation.

Using several INTERLOK blocks for a motor or valve

Another commonly used application lies in the implementation of multiple INTERLOK blocks for a motor or valve.

The same object can be installed in the INTERLOK block for this application. Enter the value 1 at the "blockname" property for the cascaded call.

If the AS block name of the currently called faceplate variable (tagname) is not appended a number, for example, its name is "L“, the AS block named "L1“ is called from the same chart in the next step, provided the corresponding variable name exists in the file manager.

If the AS block name of the currently called variable name of the faceplate is "L1“, a call of "L2“ is expected in the next step, etc.

This method basically allows the call of any number of INTERLOK blocks.

Configuration rule for this scenario:

- An "OpenNextFaceplate" button with the block name "LOCK" is installed in a VALVE faceplate
- An "OpenNextFaceplate button with the block name "1" is installed in the INTERLOK block
- INTERLOK blocks called by the faceplate type "VALVE" must be named "LOCK", "LOCK1", "LOCK2" etc. when using the method described above

Access control

The "OpenNextFaceplate" object is also assigned the "Processcontrolling_backup“ and "Higherprocesscontrolling_backup“ properties for setting permissions for the faceplate to be called. The usual default settings are here the permission levels 5 and 6. You can transfer the permissions entered in the source symbol to the "OpenNextFaceplate" object using the direct connections of "@Level5" and "@Level6".

Direct connections

@Level5/Permission/Change → OpenNextFaceplate/Processcontrolling

@Level6/Permission/Change → OpenNextFaceplate/HigherProcesscontrolling

2.3.26 "Disable / Enable messages" button

Overview objects

The "Disable/enable messages" function is implemented in the overview using this button:  .

The button is only visible to operators assigned the permission level defined at the block icon property "Processcontrolling_backup".

Properties

Object type	Object name	Picture name
Button	Button17	@PCS7Elements.pdl

The message disable/enable button corresponds with the button of the standard button set "@Buttons11.pdl", however, with a different script for instance-specific disabling/enabling of messages.

2.3.27 Quality Code displays

Layout of the Quality Code display

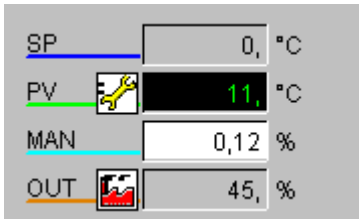
The Quality Code display represents a status display with seven alternatives.

Quality Code	Plain text	Symbol
0x68	Indefinite quality, device-related	
0x78 || 0x54	Indefinite quality, process-related	
0x14 || 0x18 || 0x00	Poor quality, device-related	
0x08 || 0x28 ***)**	Poor quality, process-related	
0x44 || 0x48 || 0x60	Simulated value	
0xA4	Maintenance required	
all other values	Good quality	(no icon)

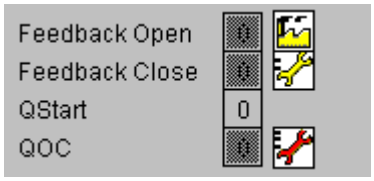
***)**	Code 0x08 is generated in the OS if communication with the AS is down.

The plain text appears as short info when you position the mouse pointer onto the Quality Code display.

The Quality Code display leads the display of **analog values**.



On the maintenance view, the Quality code display is appended to the displays of **binary values** in the valve and motor faceplates.



Properties

Object type	Object name	Picture name
User object	User object1	@PCS7Elements.pdl

2.4 Scripts

List of scripts

The scripts listed in this table are installed in the "\Siemens\WinCC\aplib\FacePlateDesigner_V6" bzw. "\Siemens\WinCC\aplib\FacePlateDesigner" folder and do **not** have to be copied to the GraCS subfolder of the project folder. The scripts are computer-specific and not project-specific.

Script name	Function
PCS7_OpenGroupDisplay_V6.Fct	Opens a "Group display" faceplate
PCS7_OpenGroupDisplay_I_V6.Fct	Opens a corresponding INTERLOK block for drives with right-click
PCS7_UpdateGroupTagname_V6.fct	A script called when the "tagname" property of the "@Faceplate" object is changed. The data are written to the "tagname“ property when the faceplate is called.
PCS7_OpenLoopDisplay_V6.Fct	Opens the loop display. Call of the "Loop" button in "@PG_%Type%.pdl"
PCS7_UpdateLoopTagname_V6.Fct	A script called when the "tag name" property of the "@Faceplate" object is changed in the loop display. The data are written to the "tagname“ property when the faceplate is called.
PCS7_CheckPermission.fct	Verifies permissions
PCS7_UpdatePermission_V6.Fct	Called when the "@CurrentUser" changes and when a view is selected in the "@PG_%Type%.pdl" and "@PG_%Type%.pdl" picture.
PCS7_ChangeView.fct	Calls another view in the faceplate. Call from "@PG_%Type%_Viewlist.pdl"
PCS7_OperationLog_V6.fct	Operation log for WinCC
PCS7_OpenCheckbox_V6.Fct	Called from the basic element "CHECKBOX_L1/R1". Opens the "@PCS7_BedCheck.pdl" control picture
PCS7_Check_OK_V6.fct	Script called in "@PCS7_BedCheck.pdl" using the "OK" button
PCS7_OpenComboBox_V6.fct	Opens the "@PCS7_BedCheck.pdl" combo box from basic element "PCS7_COMBOBOX1"
PCS7_Combo_OK_V6.fct	Script called in "@PCS7_BedCombo.pdl" using the "OK" button
PCS7_Open3ComboBox_V6.fct	Opens the "@PCS7_3BedCombo.pdl"combo box from basic element "PCS7_3COMBOBOX1"
PCS7_3Combo_OK_V6.fct	Script called in "@PCS7_3BedCombo.pdl" using the "OK" button
PCS7_OpenInputBoxBin_V6.fct	Opens the "@PCS7_BedBinaer.pdl" control picture from the basic elements "PCS7_BinOp" and "PCS7_ButtonBit"
PCS7_Binary_OK_V6.fct	Script called in "@PCS7_BedBinaer.pdl" using the "OK" button

Script name	Function
PCS7_2Stati_Variable_Changed_V6.fct	Call in basic element "PCS7_Status_2_Alternative"
PCS7_1vnStati_Variable_Changed_V6.fct	Call in basic element "PCS7_Status_1_v_n"
PCS7_OpenInputBoxAnalog_V6.fct	Opens the "@PCS7_BedAnalog.pdl" or "@PCS7_BedAnalog_NL.pdl" control picture from basic element "PCS7_AnalogValue"
PCS7_Analog_OK_V6.fct	Script called in "@PCS7_BedAnalog.pdl" or "@PCS7_BedAnalog_NL.pdl" using the "OK" button
PCS7_AnalogPercent_V6 .fct	Script called in "@PCS7_BedAnalog.pdl" for incremental input
PCS7_UpdateBarLimits_V6.Fct	Script called in basic element "PCS7_BarLimits"
PCS7_UpdateBar_V6.Fct	Script called in basic elements "PCS7_BarStandard1" and "PCS7_BarStandard2"
PCS7_Format_V6	Script for the transfer of number formats
PCS7_Trend_V6.Fct	Script for visualization of trends in a faceplate

The "PCS7_ChangeView.fct“ and "PCS7_CheckPermission.fct“ scripts are migrated from V5 without changes and thus do not carry a V6 suffix in their name.

2.5 Bitmaps

List of bitmaps

The bitmaps are installed in the "...\Siemens\WinCC\options\pdl\FaceplateDesigner_V6" folder.

The bitmaps are copied to the "GraCS" subfolder of the project folder when you run OS Project Editor.

The bitmaps are loaded dynamically to the selected pictures.

File name of the bitmap	Symbol representation	Used in	Folder
@FP_PopUpIcon.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_AlarmCrossed.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_AlarmDisabled.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_AlarmEnabled.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_NotOccupied.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_Occupied.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_OpenLoop.bmp		Faceplate, global	pdl\FaceplateDesigner
@PCS7_Lock.bmp		Motor / valve faceplate	pdl\FaceplateDesigner
@PCS7_UnLock.bmp		Motor / valve faceplate	pdl\FaceplateDesigner
@CollectValue_S.emf	S	Block icon, global ASD	
@CollectValue_F.emf	F	Block icon, global ASD	
@CollectValue_transparent.		Block icon, global ASD	
@CollectValue_empty.emf	■	Block icon, global ASD	
@Ctrl_Manual.emf	M	Controller/Block icon	
@Ctrl_intern.emf	I	Controller/Block icon	
@Ctrl_extern.emf	E	Controller/Block icon	
@Ctrl_Auto.emf	A	Controller/Block icon	
@Ctrl_Track.emf	T	Controller/Block icon	
@off.emf		Block icon OPD	pdl\Base_Data_Poo
@on.emf		Block icon OPD	pdl\Base_Data_Poo
@Auto.emf	A	Block icons, general	pdl\Base_Data_Poo
@Manual.emf	M	Block icons, general	pdl\Base_Data_Poo

File name of the bitmap	Symbol representation	Used in	Folder
MOTOR_IS_OFF.emf		Motor faceplate and block icon	pdl\FaceplateDesigner
MOTOR_Error.emf		Motor faceplate and block icon	pdl\FaceplateDesigner
MOTOR_IS_ON		Motor faceplate and block icon	pdl\FaceplateDesigner
MOTOR_OFF.emf		Motor faceplate and block icon	pdl\FaceplateDesigner
MOTOR_ON.emf		Motor faceplate and block icon	pdl\FaceplateDesigner
VAZ_H.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VAZ_H_CLOSE.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VAZ_H_OPEN.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
Valve_NL.emf		Valve block icon (interlock)	pdl\FaceplateDesigner
Valve_L.emf		Valve block icon (interlock)	pdl\FaceplateDesigner
VHO_closed.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VHO_opened.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VHO_Error.emf		Valve faceplate and block icon	
VHO_undef.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VHZ_closed.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VHZ_opened.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VHZ_undef.emf		Valve faceplate and block icon	pdl\FaceplateDesigner
VVE_closed.emf		Valve block icon	pdl\FaceplateDesigner
VVE_opened.emf		Valve block icon	pdl\FaceplateDesigner
VVE_Error.emf		Valve block icon	pdl\FaceplateDesigner
VVE_undef.emf		Valve block icon	pdl\FaceplateDesigner
VVT_closed.emf		Valve block icon	pdl\FaceplateDesigner
VVT_opened.emf		Valve block icon	pdl\FaceplateDesigner
VVT_undef.emf		Valve block icon	pdl\FaceplateDesigner

2.6 Pictures

Picture list

The pictures listed below are installed in the "...\Siemens\WinCC\options\pdl\FaceplateDesigner_V6" folder.

They are copied to the "GraCS" subfolder of the project folder when you run OS Project Editor.

Pictures	
@PCS7Elements.Pdl	Picture template for basic elements
@@PCS7Typicals.pdl	Picture template for block icons from the TH supplement block icons
@Template.pdl	Picture template of block icons for Graphics Object Update Only difference to "@@PCS7Typicals.pdl": the "type" property.
@PCS7_BedAnalog.pdl	Analog value control picture
@PCS7_BedAnalog_NL.pdl	Analog value control picture without limits, scroll bars or incremental input.
@PCS7_BedBinaer.pdl	Single-button binary control picture, only confirmation (example: Open/Close/manual/Auto for valve / motor)
@PCS7_BedCheck.pdl	Two-button control picture (example: activate alarm/warning)
@PCS7_BedKombo.pdl	Two-button binary control picture (e.g. manual/auto mode for controller)
@PCS7_3BedKombo.pdl	Three-button binary control picture (e.g. manual/auto mode for controller)
@PCS7_AnalogInputwithLimits.pdl	Analog value control picture (not used but still supplied for reasons of compatibility with V5.1)
@PCS7_BinaryInput1of2.pdl	Binary value control picture (not used but still supplied for reasons of compatibility with V5.1)
@PCS7_ALARM.pdl	Display of the message view in faceplates with alarm
@PCS7_BATCH.pdl	Display of the batch view in faceplates
@PCS7_TREND.pdl	Display of the trend view in analog faceplates
@PG_%Type%.pdl	Picture template for prototype picture faceplate
@PG_%Type%_%View%.pdl	Picture template for sublevel views in the windows
@PG_%Type%_VIEWLIST.pdl	Picture template for the view selection menu
@PG_%Type%_OverView.pdl	Picture template for the overview
@PL_%Type%.pdl	Picture template for the loop display

2.7 Faceplates

General information

For information on which parameters of the AS block instance can be used to visualize the various display objects in the faceplate, refer to the offline dialog of Graphics Designer.

Block comment

The CFC block comment is visualized on the faceplate as short info (tooltip) showing the variable name.

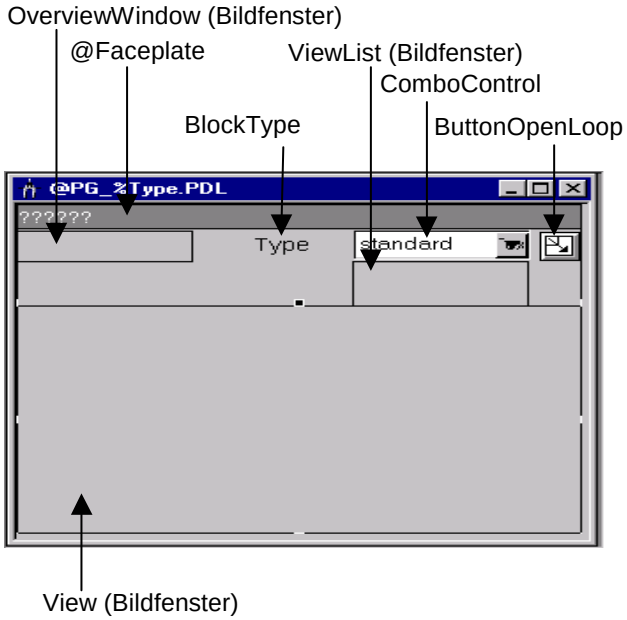
This method ensures that the description of the technological function is always available in the faceplate.

2.7.1 Basic data of the picture templates

2.7.1.1 @PG_%Type%.pdl

Overview

The "@PG_%Type%.pdl" template is available for configuring the views.



The next section describes the functionality of the various elements:

OverviewWindow

Window used to visualize alarm and batch states, and for instance-specific message acknowledgment and enabling messages of the faceplate. A group display is usually shown here. If the faceplate is used for a multiple instance block it may also show several group displays. The display is defined in the configuration of the "@PG_<Type>_Overview.pdl“ picture. The same picture is shown in the loop view of the faceplate.

Used to visualize the block instance or variable of the calling object. It is also used to store additional faceplate information such as FirstView, the name of the batch variable or CurrentUser.

User object with I/O field, for storing data of the trend function "Trendpage". This object is hidden in online mode.

Name of the faceplate type. This type name forms part of the name of all views belonging to the faceplate. This object is hidden in online mode.

ViewList

Window used to visualize and select existing views.

ComboControl

Selection and display element for the various views. The element always shows the name of the active view.

ButtonOpenLoop

Object for selecting the loop picture. Faceplate Designer automatically hides this object if generation or update of the loop view is not selected.

View

Window used to display the various faceplate views.

OperationWindow

Window used to display analog value input.

ComboWindow

Window used to display binary value input.

2.7.1.2 @PG_%TYPE%

@PG_%TYPE% picture object

Geometry/Pos	X=0, y = 0
Geometry/Dimensions	Width = 320, Height = 260

"View" window

Geometry/Pos	X=1, y = 47
Geometry/Dimensions	Width = 320, Height = 214

User object @Faceplate

Elements of the "@Faceplate" user object:

Property in the user object	Element	Type	Default
Geometry/Pos	X=0, y = 0		
Geometry/Dimensions	Breite = 320, Höhe = 20		
Tagname	Tagname	Stat.Text	None
Tag	Tag	Stat.Text	Text = MKZ
FirstView	FirstView	I/O box	Output value is set by Faceplate Designer
CurrentUser	CurrentUser	I/O box	Output value = interconnection to internal variable @Current User
BName	VarBatchname	I/O box	Output value = .BA_NA
BATCH_ID	VarBatchID	I/O box	Output value = .BA_ID
STEP_NO	VarBatch Stepnumber	I/O box	Output value = .STEP_NO
STEP_N1	VarBatch Stepnumber_N1	I/O box	Output value = .STEP_N1
Areaname	Areaname	I/O box	Output value = .#areaname
Processcontrolling_backup	POP	I/O box	Permission = Processcontrolling
HigherProcess controlling_backup	HIPOP	I/O box	Permission = Higher Processcontrolling
MULTI_INSTANCE	HIPOP.Hidden Input	I/O box	True = MultiInstanceFaceplate

2.7.1.3 @PG_%Type%_%View%.pdl

@PG_%Type%_%View% picture object

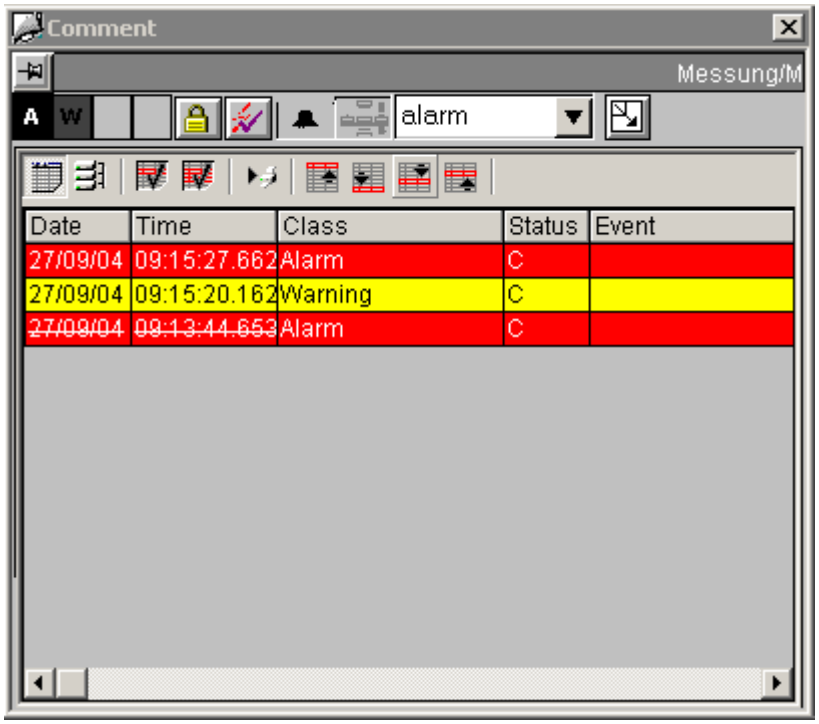
Geometry/Pos	X=0, y = 0
Geometry/Dimensions	Width = 320, Height = 214

Rectangle @Frame

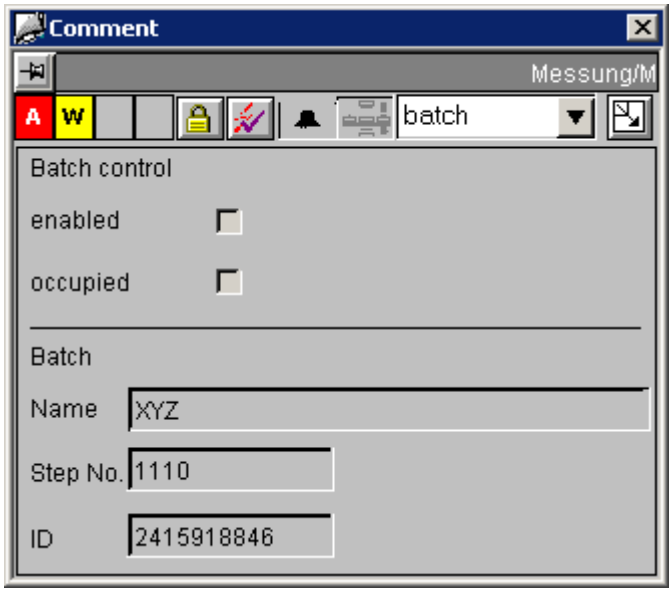
Geometry/Pos	X=1, y = 50
Geometry/Dimensions	Width = 320, Height = 214

2.7.2 Global views

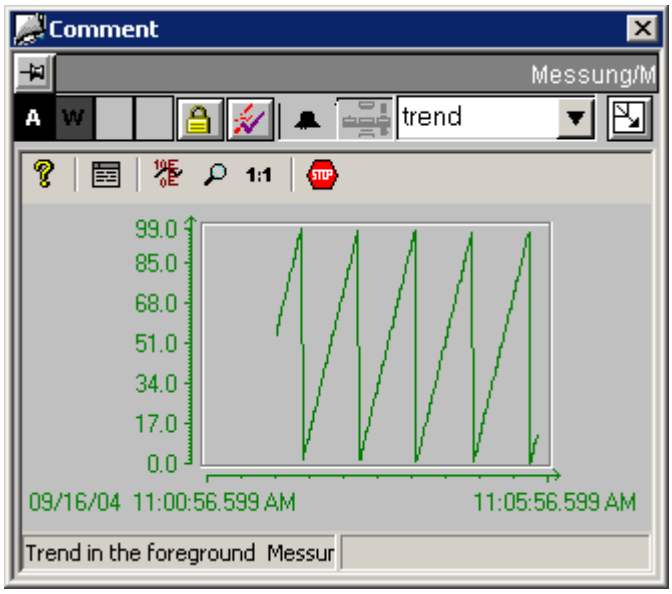
2.7.2.1 Message view



2.7.2.2 Batch view



2.7.2.3 Trend view



See also chapter 2.1.8, "Configuring trend views".

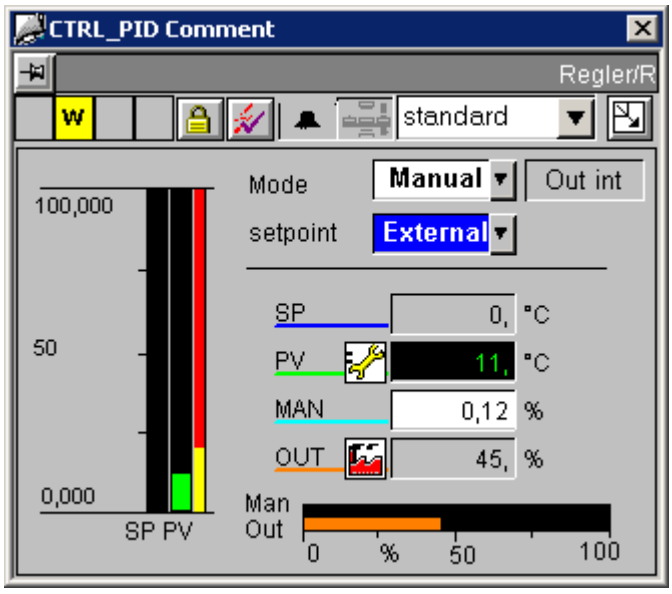
2.7.3 CTRL_PID

2.7.3.1 CTRL_PID: Views

The description of the CTRL_PID faceplate and of its "standard view", "maintenance view", "parameter view" and "limits view" in the next section is representative for all PCS 7 faceplates.

For information about all faceplates, refer to the online help of the PCS 7 faceplates.

2.7.3.2 CTRL_PID: Standard view



Faceplate standard view in V6.0 or higher

Analog displays and number formats

All analog displays are implemented using the "AdvancedAnalogDisplay" object. The number format is defined at the "Format_InputValue" and "Format_OutputValue" properties of the block icon. See chapter 2.1.7, "Configuring number formats".

Access control

The view features two permission objects for the input of setpoints and manipulated values, as permissions for these variables depend on different factors:

- "Permission_Setpoint"
- "Permission_Manual"

See also chapter 2.3.24, Basic elements, Permission Object.

In addition to the WinCC user rights, the permission objects evaluate the parameters listed below:

Permission object	**Parameters**
"Permission_Setpoint"	"Q_SP_OP = TRUE"
"Permission_Manual"	"QLMNOP = TRUE"

Using PID Tuner and tuning

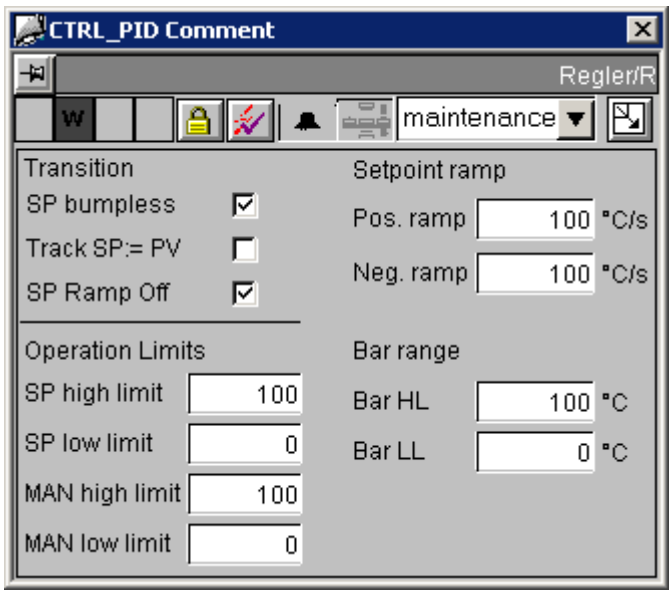
Operate the PID Tuner in the parameter view (Tuning on/off).

A combo box is output above the operating mode combo box „Manual/Auto“ in the standard view when you enable tuning in the parameter view.
Tuning is also disabled again using this combo box in the standard view.
All other operations of the controller are locked when "Tuning On“ is set.

Sequence and positioning of direct connections at the control objects

@Level5	->	**Operator input enable**		
Manual_COMBOBOX	->	Operator input enable		
External_COMBOBOX	->	Operator input enable		
Permission_Setpoint	->	Level_Source	->	Level_Target
Permission_Manual	->	Level_Source		
Permission_Setpoint	->	**Target_OP_enable**		
Setpoint_AnalogValue	->	Operator input enable		
Permission_Manual	->	**Target_OP_enable**		
Manual_AnalogValue	->	Operator input enable		
Format	->	**Format_InputValue**		
Setpoint_AnalogValue	->	Format		
ProcessValue_AnalogValue	->	Format		
Format	->	**Format_OutputValue**		
Manual_AnalogValue	->	Format		
Output_AnalogValue	->	Format		

2.7.3.3 CTRL_PID: Maintenance view



Access control

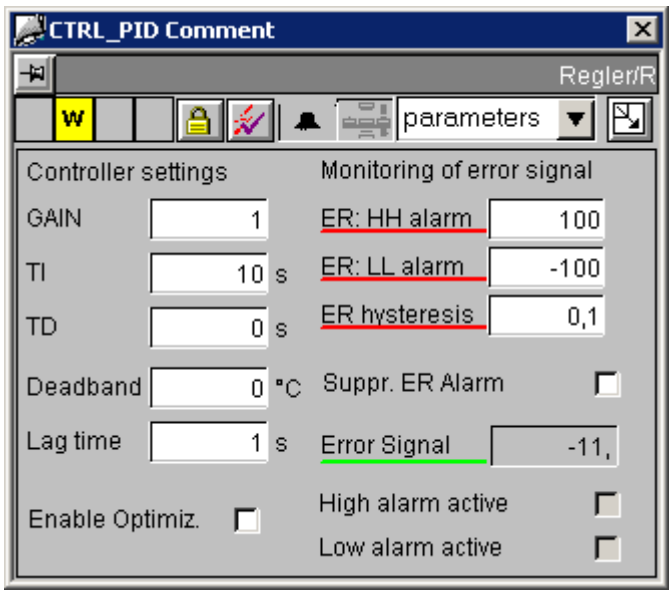
The "Permission_SP_Bumpless“ object evaluates the WinCC permission levels and the "OPTI_EN = FALSE“ parameter.

Sequence and positioning of direct connections at the control objects

@Level6	->	**Operator input enable**
Permission_SP_Bumpless	->	Level_Source
Permission_SP_Bumpless	->	**Target_OP_enable**
Bumbless_CHECKBOX_L	->	Operator input enable
SP_TRK_ON_CHECKBOX_L	->	Operator input enable
SPRAMP_OFF_CHECKBOX_L	->	Operator input enable
SPHighLimit_AnalogValue	->	Operator input enable
SPLowLimit_AnalogValue	->	Operator input enable
ManHighLimit_AnalogValue	->	Operator input enable
ManLowLimit_AnalogValue	->	Operator input enable
SPURLM_AnalogValue	->	Operator input enable
SPDRLM_AnalogValue	->	Operator input enable
MO_PVHR_AnalogValue	->	Operator input enable
MO_PVLR_AnalogValue	->	Operator input enable
Permission_SP_Bumpless	->	Format
SPHighLimit_AnalogValue	->	BackgroundColor_Value

SPLowLimit_AnalogValue	->	BackgroundColor_Value
ManHighLimit_AnalogValue	->	BackgroundColor_Value
ManLowLimit_AnalogValue	->	BackgroundColor_Value
SPURLM_AnalogValue	->	BackgroundColor_Value
SPDRLM_AnalogValue	->	BackgroundColor_Value
MO_PVHR_AnalogValue	->	BackgroundColor_Value
MO_PVLR_AnalogValue	->	BackgroundColor_Value

2.7.3.4 CTRL_PID: Parameter view



Analog displays and number formats

The "ControlError_AnalogValue" process value is implemented using the "AdvancedAnalogDisplay" object. The number format is defined at the "Format_InputValue" property of the block icon.

All other analog displays are implemented using the standard "Floating-point format“ I/O box.

Access control

The "Permission_Gain“ object evaluates the WinCC permission levels and the "OPTI_EN = FALSE“ parameter.

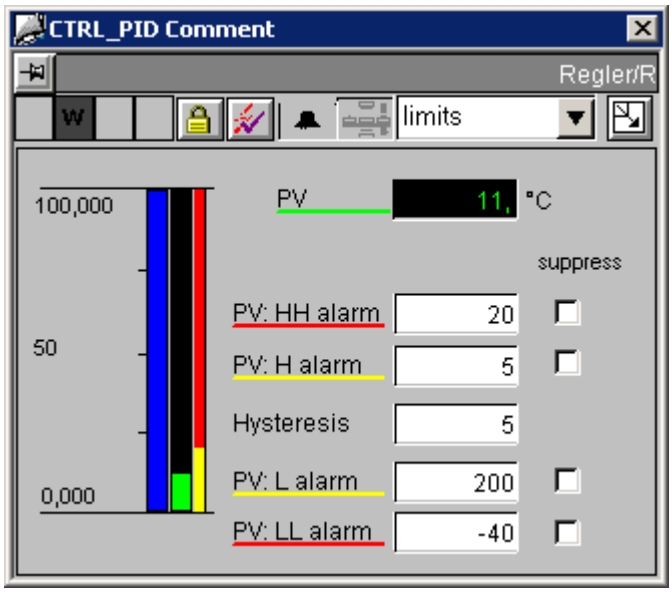
Sequence and positioning of direct connections at the control objects

@Level6	->	**Operator input enable**
Permission_Gain	->	Level_Source
OPTI_EN_CHECKBOX_L	->	Operator input enable
Permission_Gain	->	**Target_OP_enable**
Gain_AnalogValue	->	Operator input enable
TN_AnalogValue	->	Operator input enable
TV_AnalogValue	->	Operator input enable
DEADB_W_AnalogValue	->	Operator input enable
TM_LAG_AnalogValue	->	Operator input enable

ERH_ALM_AnalogValue	->	Operator input enable
ERL_ALM_AnalogValue	->	Operator input enable
ER_HYS_AnalogValue3	->	Operator input enable
M_SUP_ER_CHECKBOX_L	->	Operator input enable
Permission_Gain	->	**Target_BackgroundColor**
Gain_AnalogValue	->	BackgroundColor_Value
TN_AnalogValue	->	BackgroundColor_Value
TV_AnalogValue	->	BackgroundColor_Value
DEADB_W_AnalogValue	->	BackgroundColor_Value
TM_LAG_AnalogValue	->	BackgroundColor_Value
ERH_ALM_AnalogValue	->	BackgroundColor_Value
ERL_ALM_AnalogValue	->	BackgroundColor_Value
ER_HYS_AnalogValue3	->	BackgroundColor_Value
Format	->	**Format_InputValue**
ControlError_AnalogValue	->	Format

2.7.3.5 CTRL_PID: Limits view

Setpoint input limits



The setpoint bar graph in this view shows the setpoint input limits relative to bar graph limits.

Adjust the setpoint input limits in the maintenance view.

Analog displays and number formats

The "ProcessValue_AnalogValue" process value is implemented using the "AdvancedAnalogDisplay" object. The number format is defined at the "Format_InputValue" property of the block icon.

All other analog displays are implemented using the standard "Floating-point format“ I/O box.

Access control

The "Permission_AlarmHigh_AnalogValue“ permission object evaluates WinCC permission levels and the "OPTI_EN = FALSE“ parameter.

Sequence and positioning of direct connections at the control objects

@Level6		**Operator input enable**
Permission_AlarmHigh_AnalogValue	->	Level_Source
Permission_AlarmHigh_AnalogValue	->	**Target_OP_enable**
AlarmHigh_AnalogValue	->	Operator input enable
WarningHigh_AnalogValue	->	Operator input enable
Hysteresis_AnalogValue	->	Operator input enable
WarningLow_AnalogValue	->	Operator input enable
AlarmLow_AnalogValue	->	Operator input enable
AlarmHigh_CHECKBOX_R	->	Operator input enable
WarningHigh_CHECKBOX_R	->	Operator input enable
WarningLow_CHECKBOX_R	->	Operator input enable
AlarmLow_CHECKBOX_R	->	Operator input enable
Permission_AlarmHigh_AnalogValue	->	**Target_BackgroundColor**
AlarmHigh_AnalogValue	->	BackgroundColor_Value
WarningHigh_AnalogValue	->	BackgroundColor_Value
Hysteresis_AnalogValue	->	BackgroundColor_Value
WarningLow_AnalogValue	->	BackgroundColor_Value
AlarmLow_AnalogValue	->	BackgroundColor_Value
Format	->	**Format_InputValue**
ProcessValue_AnalogValue	->	Format

2.8 Block icons

2.8.1 Process control

Note

The block icons are not provided process control elements. All process control actions are carried out at the faceplates.

2.8.2 @@PCS7Typicals.pdl and @Template.pdl picture templates

Functions of the block icons

The previously supplied block icons (V5.x) in the @@**PCS7Typicals.pdl** and @**Template.pdl** pictures can be used to open all faceplate variants (OCX or faceplate V5.1 / V5.2 / V6.0) on the corresponding prototype picture.

However, these new functions are only available for use with the new block icons.

The new block icons are saved to the @@**PCS7Typicals.pdl** and @**Template.pdl** pictures.

@@PCS7Typicals.pdl

The @@**PCS7Typicals.pdl** picture is used for automatic creation of block icons from the TH.

The symbols for all OS-relevant CFC blocks can be created in a picture for the charts of the hierarchy folder and, depending on the configuration, for the subfolders if this picture meets the following requirements:

- It is available in the Technological Hierarchy (TH)
- The "Derive block icons from TH" option is set

Options of creating the block icons:

- Select the "Create/Modify Block Icons" command in the TH
- Enable the corresponding check box in the wizard when executing the "Compile OS" function

Rules:

A copy of a block icon with "type" property string "@CTRL_PID/1" from the @@**PCS7Typicals.pdl** picture is created in this picture for a CFC block instance assigned the symbolic type name CTRL_PID.

If you want to edit the "@@PCS7Typicals.pdl" picture, copy it to a file named "@PCS7Typicals.pdl" and then edit this copy. The "@PCS7Typicals.pdl" picture is automatically derived from the TH if it exists in the project.

Note

All block icons in the pictures which also exist in "@@PCS7Typicals.pdl" and have not been derived form the TH will be deleted during automatic generation. When manually configuring and touching up the pictures, you should for this reason use picture template "@Template.pdl" for the block icons, as this template has a different default setting of the "type" property.

PCS7 V6 or higher supports the configuration of this reference at a CFC block instance, and there is no mandatory naming convention at the "type" property. In addition, you can generate multiple different block icons for one block type in the ES.

Example:

The symbolic name "XXX" is entered at a CTRL_PID instance. A reference is created in the @@**PCS7Typicals.pdl** picture to a block icon that contains the string "@CTRL_PID/XXX" in its "type" property.

@Template.pdl

The @**Template.pdl** picture is primarily used as template for manual configuration of block icons in the WinCC pictures. The block icons in these two pictures only differ in terms of their "**type**" property. The property may not be modified at the "@@PCS7Typicals.pdl" picture (naming convention, for example, @MEAS_MON/1), as it is used as cross-reference to objects which are generated and deleted based on the TH.

This property may not be changed in @**Template.pdl**.

Always assign the property a name other than the name already defined at the block icons in @@PCS7Typicals. The program may otherwise delete the block icons copied from this template from the pictures which were generated based on the TH.

You should first create a copy of the "@Template.pdl" picture and assign it a different name, and then edit this copy in order to modify the existing symbols. The OS Project Editor (previously Split Picture Wizard) will otherwise reset the picture.

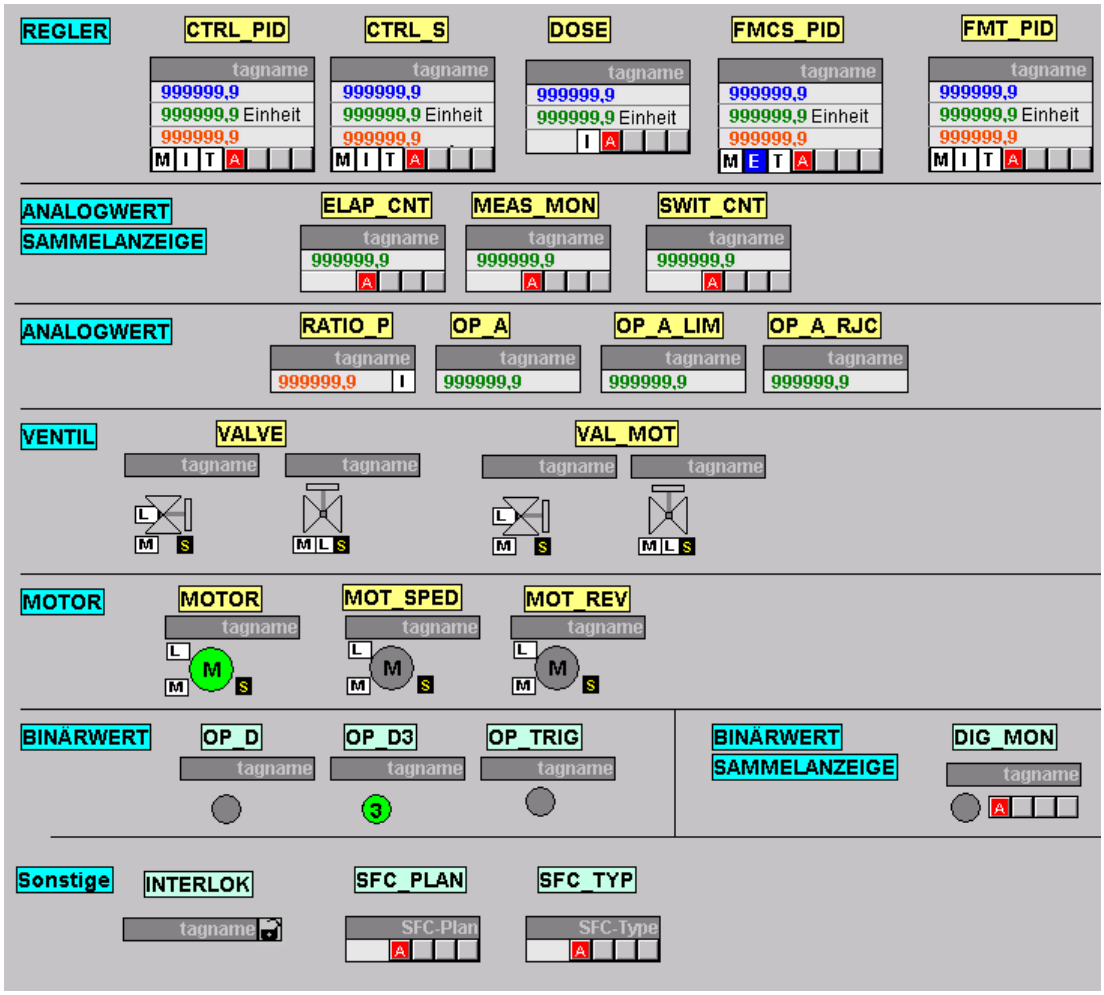
Updating picture objects

The @@**PCS7Typicals.pdl** and @**Template.pdl** pictures can be used to run the "**Update picture object**" wizard.

The "type" property is once again used as reference to determine the objects to be replaced.

2.8.3 Block icons in the @@PCS7_Typicals picture

Overview



2.8.4 Properties of the block icons

2.8.4.1 General properties

Basic properties

Properties at the block icons of the "@@PCS7Typicals" picture which you should never change:

- Geometry/Width
- Geometry/Height
- Other/OP_enabled
- Other/Password
- Other/Display
- General/Servername
- Styles/GroupRelevant (only for blocks with Alarm_8P messages)

Properties which exist in all block icons

Properties which exist in all block icons:

Properties	Element and property in user object	Object	Description
Other/Processcontrolling_backup	POP.Permission	I/O box	Instance-specific permission, default = 5
Other/HigherProcesscontrolling_backup	HIPOP.Permission	I/O box	Instance-specific permission, default = 6
General/tag	NameOfTag.OutputValue	I/O box	Symbol text displayed
General/type	Type.OutputValue	I/O box	Reference for the generation of symbols from the TH and for wizards
General/tagname	Tagname.OutputValue	I/O box	Actual variable name that is passed to the variable prefixes of the windows
General/Servername	Servername.OutputValue	I/O box	Block / faceplate type
General/Version	Version.OutputValue	I/O box	Version number
Styles/View_Tag	NameOfTag.Display Rectangle17.Display (if it exists)	Rectangle I/O box	Can be used to hide the variable name
MouseClick left	PCS7_OpenGroupDisplay_V6 (lpszPictureName, lpszObjectName)		Calls the faceplate

2.8.4.2 CTRL_PID

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 110/Height = 77		
General/UnitPV	UnitPV.Text	Stat.Text	Display: PV unit
General/ Unit_MAN_OP	Unit_MAN_OP.Text	Stat.Text	Display: MAN_OP unit
Links/ CollectValue	GroupDisplay.CollectValue	GroupDisplay	.EventState
Links/ SetpointValue	SetpointValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Setpoint
Links/ ProcessValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Links/ OutputValue	OutputValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Manipulated variable
Links / LMN_SEL	Tracking_AdvancedStatus Display.Status	AdvancedStatusDis.	Display: Manipulated variable correction
Links/ Mode_MAN_AUT	Manual_AdvancedStatus Display.Status	AdvancedStatusDis.	Display: Manual/Auto
Links/ Mode_INT_EXT	External_Advanced StatusDisplay.Status	AdvancedStatusDis.	Display: External/Internal
Styles/ ReturnPath	TrendFunctions2 .Output value	I/O box	See section 2.1.8, "Configuring trend views"
Styles/ StandardTrend	TrendFunctions2 .CharacterSetSize	I/O box	See section 2.1.8, "Configuring trend views"
Styles/ Format_InputValue	ProcessValue_Advanced AnalogDisplay.Format SetpointValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis. AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	OutputValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.3 CTRL_S

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 110/Height = 77		
General/UnitPV	Unit.Text / .PV_IN#unit	Stat.Text	Display: PV unit
General/Unit_MAN_OP	Unit.Text / .MAN_OP#unit	Stat.Text	Display: Manipulated variable unit
Links/CollectValue	GroupDisplay.CollectValue/	Group display	.EventState
Links/SetpointValue	SetpointValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Setpoint
Links/ ProcessValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Links/OutputValue	OutputValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Manipulated variable
Links/Mode_MAN_AUT	Manual_AdvancedStatus Display.Status	AdvancedStatusDis.	Display: Manual/Auto
Links/Mode_INT_EXT	External_Advanced StatusDisplay.Status	AdvancedStatusDis.	Display: External/Internal
Links /LMN_SEL	Tracking_AdvancedStatus Display.Status	AdvancedStatusDis.	Display: Manipulated variable correction
Links /QLMNR_ON	OutputValue_Advanced AnalogDisplay.Display Unit_MAN_OP.Display	AdvancedAnalogDis. Stat.Text	Description See below
Links /QLMNUP	LMNUP_StatusDisplay	Stat.Text	Display: QLMNUP
Links /QLMNDN	LMNDN_StatusDisplay	Stat.Text	Display: QLMNDN
Styles/ReturnPath	TrendFunctions2 .Output value	I/O box	See section 2.1.8, "Configuring trend views"
Styles/StandardTrend	TrendFunctions2 .CharacterSetSize	I/O box	See section 2.1.8, "Configuring trend views"
Styles/Format_InputValue	ProcessValue_advanced AnalogDisplay.Format SetpointValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis. AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	OutputValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

Difference between the CTRL_S and CTRL_PID block icons:
If position feedback (LMNR_ON = 0) is not available, the program displays the binary control signals QLMNUP and QLMNDN instead of the manipulated variable.

The visibility of these texts is also controlled by scripts. The scripts are called when you change QLMNUP and QLMNDN.

Note

The "OutputValue_AdvancedAnalogDisplay“ and "Unit_MAN_OP“ objects must always be brought to the foreground in the user object, in order to ensure proper functioning of the visualization control.

2.8.4.4 DOSE

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 110/Height = 63		
General/UnitPV	UnitPV.Text	Stat.Text	Display: PV unit
Links/CollectValue	GroupDisplay.CollectValue	Group display	.EventState
Links/ProcessValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Links/SetpointValue	SetpointValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Setpoint
Links/SetpointExternal	External_Advanced StatusDisplay.Status SetpointExternValue_ Advanced AnalogDisplay .Display	AdvancedStatusDis. AdvancedAnalogDis	.QSPEXTON See below for description
Links/ValueSetpointExternal	SetpointExternValue_ AdvancedAnalogDisplay.Value	AdvancedAnalogDis	Displayed with .QSPEXTON using setpoint
Styles/ReturnPath	TrendFunctions2 .Output value	I/O box	See section 2.1.8, "Configuring trend views"
Styles/StandardTrend	TrendFunctions2 .CharacterSetSize	I/O box	See section 2.1.8, "Configuring trend views"
Styles/Format_InputValue	ProcessValue_Advanced AnalogDisplay.Format SetpointValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis. AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	OutputValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

The DOSE block does not contain a parameter which represents the effective setpoint. The program outputs the setpoint display for this reason, depending on the QSPEXTON status.

QSPEXTON = 0 → "SetpointValue_AdvancedAnalogDisplay" is displayed

QSPEXTON = 1 → "SetpointExternValue_ AdvancedAnalogDisplay " is displayed

2.8.4.5 FMCS_PID/FMT_PID

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 110/Height = 77		
General/UnitPV	Unit.Text / .PV#unit	Stat.Text	Display: PV unit
General/Unit_MAN_OP	Unit.Text/.LMN#unit	Stat.Text	Display: Manipulated variable unit
Links/CollectValue	GroupDisplay.CollectValue/	Group display	.EventState
Links/SetpointValue	SetpointValue_Advanced AnalogDisplay.Value/.SP	AdvancedAnalogDis.	Display: Setpoint
Links/ProcessValue	ProcessValue_Advanced AnalogDisplay.Value/.PV	AdvancedAnalogDis.	Display: Process value
Links/OutputValue	OutputValue_ Advanced AnalogDisplay.Value/.LMN	AdvancedAnalogDis.	Display: Manipulated variable
Links/Tracking	Tracking_AdvancedStatus Display.Status	AdvancedStatusDis.	Display: Tracking LMN
Links/Mode_MAN_AUT	Manual_AdvancedStatus Display.Status	AdvancedStatusDis.	Display: Manual/Auto
Links/Mode_INT_EXT	External_Advanced StatusDisplay.Status	AdvancedStatusDis.	Display: External/Internal
Styles/ReturnPath	TrendFunctions2 .Output value	I/O box	See section 2.1.8, "Configuring trend views"
Styles/StandardTrend	TrendFunctions2 .CharacterSetSize	I/O box	See section 2.1.8, "Configuring trend views"
Styles/Format_InputValue	ProcessValue_advanced AnalogDisplay.Format SetpointValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis. AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	OutputValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.6 ELAP_CNT

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 97/Height = 45		
General/Unit	Unit.Text	Stat.Text	Display: Unit
Links/CollectValue	GroupDisplay.CollectValue	Group display	.EventState
Links/Output_Value	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	.HOURS Display max. 7 digits
Styles/Format_InputValue	ProcessValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	Format_OutputValue. OutputValue	I/O box	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.7 MEAS_MON

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 97/Height = 45		
General/Unit	Unit.Text	Stat.Text	Display: Unit
Links/CollectValue	GroupDisplay.CollectValue	Group display	.EventState
Links/OutputValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Styles/ReturnPath	TrendFunctions2 .Output value	I/O box	See section 2.1.8, "Configuring trend views"
Styles/StandardTrend	TrendFunctions2 .CharacterSetSize	I/O box	See section 2.1.8, "Configuring trend views"
Styles/Format_InputValue	ProcessValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	Format_OutputValue. OutputValue	I/O box	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.8 SWIT_CNT

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 97/Height = 45		
General/Unit	Unit.Text	Stat.Text	.V#UNIT
Links/CollectValue	GroupDisplay.CollectValue	Group display	.EventState
Links/OutputValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Styles/Format_InputValue	ProcessValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	Format_OutputValue .OutputValue	I/O box	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.9 RATIO_P

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 97/Height = 32		
General/Unit	Unit.Text	Stat.Text	Display: Unit
Links/OutputValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Links/Mode_INT_EXT	External_Advanced StatusDisplay.Status	AdvancedStatusDis.	Display: External/Internal
Styles/Format_InputValue	ProcessValue_advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	Format_OutputValue .OutputValue	I/O box	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.10 OP_A

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 97/Height = 32		
General/Unit	Unit.Text	Stat.Text	Display: Unit
Links/OutputValue	ProcessValue_Advanced AnalogDisplay.Value	AdvancedAnalogDis.	Display: Process value
Styles/Format_InputValue	ProcessValue_Advanced AnalogDisplay.Format	AdvancedAnalogDis.	Formats the process value and setpoint numbers
Styles/Format_OutputValue	Format_OutputValue. OutputValue	I/O box	Formats the manipulated variable numbers
Styles/Format_xx	Format_xx.OutputValue	I/O box	Additional format, see chapter 2.1.7, "Configuring number formats"

2.8.4.11 OP_A_LIM

Properties

Properties and visualization as OP_A; see chapter 2.8.4.10, OP_A

2.8.4.12 OP__A_RJC

Properties

Properties and visualization as OP_A; see chapter 2.8.4.10, OP_A

2.8.4.13 VALVE

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 67		
Links/CollectValue	GroupDisplay_withASD .CollectValue	AdvancedStatusDis.	.EventState
Links/QMAN_AUT	Mode.Status1	AdvancedStatusDis.	Display: Auto/Manual
Links/V_LOCK	Interlock.Status1	AdvancedStatusDis.	Display: Lock
Links/QOPENED	Valve_Status.Status1	AdvancedStatusDis.	Display: Valve
Links/QCLOSED	Valve_Status.Status2	AdvancedStatusDis.	Display: Valve
Links/QOPENING	Valve_Status.Status3	AdvancedStatusDis.	Display: Valve
Links/QCLOSING	Valve_Status.Status4	AdvancedStatusDis.	Display: Valve

Left-click calls the VALVE faceplate. Right-click calls the corresponding INTERLOK faceplate.

The name of the INTERLOK block is stored as script transfer parameter, see chapter 2.4 "Scripts"

The default block name is "L“. The INTERLOK block and the VALVE block must be placed in the same CFC chart.

2.8.4.14 VAL_MOT

Properties

Properties and visualization as at VALVE; see chapter 2.8.4.13, VALVE

2.8.4.15 MOTOR

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 54		
Links/CollectValue	GroupDisplay_withASD .CollectValue	AdvancedStatusDis.	.EventState
Links/QMAN_AUT	Mode.Status1	AdvancedStatusDis.	Display: Auto/Manual
Links/LOCK	Interlock.Status1	AdvancedStatusDis.	Display: Lock
Links/QRUN	Motor_Status.Status1	AdvancedStatusDis.	Display: Motor
Links/QSTOP	Motor_Status.Status2	AdvancedStatusDis.	Display: Motor

Left-click calls the MOTOR faceplate. Right-click calls the corresponding INTERLOK faceplate.

The name of the INTERLOK block is stored as script transfer parameter, see chapter 2.4 "Scripts"

The default block name is "L“. The INTERLOK block and the MOTOR block must be placed in the same CFC chart.

2.8.4.16 MOT_SPED

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 53		
Links/CollectValue	GroupDisplay_withASD .CollectValue	AdvancedStatusDis.	.EventState
Links/QMAN_AUT	Mode.Status1	AdvancedStatusDis.	Display: Auto/Manual
Links/LOCK	Interlock.Status1	AdvancedStatusDis.	Display: Lock
Links/QRUN	Motor_Status.Status1	AdvancedStatusDis.	Display: Motor
Links/QSTOP	Motor_Status.Status2	AdvancedStatusDis.	Display: Motor
Links/QSPEED	Motor_Status.Status3	AdvancedStatusDis.	Display: Motor
Links/QSTOPING	Motor_Status.Status4	AdvancedStatusDis.	Display: Motor

Left-click calls the MOT_SPED faceplate. Right-click calls the corresponding INTERLOK faceplate.

The name of the INTERLOK block is stored as script transfer parameter, see chapter 2.4 "Scripts"

The default block name is "L“. The INTERLOK block and MOT_SPED must be placed into the same CFC chart.

2.8.4.17 MOT_REV

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 53		
Links/CollectValue	GroupDisplay_withASD .CollectValue	AdvancedStatusDis.	.EventState
Links/QMAN_AUT	Mode.Status1	AdvancedStatusDis.	Display: Auto/Manual
Links/LOCK	Interlock.Status1	AdvancedStatusDis.	Display: Lock
Links/QRUN	Motor_Status1.Status1	AdvancedStatusDis.	Display: Motor
Links/QSTOP	Motor_Status1.Status2	AdvancedStatusDis.	Display: Motor
Links/QDIR	Motor_Status1.Status3	AdvancedStatusDis.	Display: Motor

Left-click calls the MOT_REV faceplate. Right-click calls the corresponding INTERLOK faceplate.

The name of the INTERLOK block is stored as script transfer parameter, see chapter 2.4 "Scripts"

The default block name is "L“. The INTERLOK block and MOT_REV must be placed into the same CFC chart.

2.8.4.18 INTERLOK

Properties

Siehe auch Kapitel 2.8.4 "Allgemeine Eigenschaften"

Eigenschaften	Element und Eigenschaft im Anwenderobjekt	Objekt	Beschreibung
Geometrie	Breite = 108/Höhe = 20		
Links/Link	Lock.AktuellerZustand	ZusAnz.	Lock Symbol

2.8.4.19 OP_D3

Properties

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 45		
Links/Output1	StatusDisplay1.Display	StatusDisplay	.Q1
Links/Output2	StatusDisplay 2.Display	StatusDisplay.	.Q2
Links/Output3	StatusDisplay 3.Display	StatusDisplay.	.Q3

2.8.4.20 OP_D

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 45		
Links/Status	StatusDisplay1.ActualStatus	StatusDisplay	.Q0

2.8.4.21 OP_TRIG

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 40		
Links/Status	StatusDisplay1.ActualStatus	StatusDisplay	.SIGNAL

2.8.4.22 DIG_MON

Properties

See also chapter 2.8.4, "General properties"

Properties	Element and property in user object	Object	Description
Geometry	Width = 90/Height = 40		
Links/Status	StatusDisplay1.ActualStatus	StatusDisplay	.Q
Links/CollectValue	GroupDisplay3.CollectValue	Group display	.EventState

3 Creating the Online Help

3.1 Requirements

Software requirements:

- The "Notepad" ASCII editor integrated in WINDOWS or a similar editor for creating a registry file
- A tool for creating the help topics (for example, "RoboHelp")

3.2 Structure of the help file

Help file

You create an online help system for your blocks by writing a help file using the help authoring system. You can assign this file a user-specific name. For reasons of clarity, you should use the name of your library or a name shared by your blocks. Example: "**MYLIB__a.HLP**".

Help topic

Create a separate topic for each one of your blocks. Define the Online Help entry address for each topic ("Topic-ID" + "Map #") and enter this address in the registry (cf. chapter 3.3). You can select any addresses. However, these must be unambiguous in the online help system.

If you library is relatively complex, you can also create an hm file which contains all IDs used. You can assign the MAP IDs using the RoboHelp authoring tool of this file.

Entries in the hm file:

```
// Headerfile for Online Help Mylib function blocks
//
#define CONTROL   0x10                  // decimal 16
#define CONTROL2  0x11                  // decimal 17
#define CONTROL3  0x12                  // decimal 18
....
```

In addition to the help text, each topic contains the following information:

Topic title	Help topic title for this block (usually the block name, perhaps with short name of the function).
Topic ID	Name and MAP ID of the topic (as specified in the registry file see Fig. 1–3)
Index	Keywords which can be used to jump to a topic from the help index

HLP and CNT files

The help system may consist of two files: The HLP file which contains the topics and a CNT file which contains the index.

The CNT file is only useful if the block help is not to be used exclusively as context-sensitive help system. The context-sensitive help for the selected block is called by pressing F1. The help topics of a library which contains several blocks may be listed in a table of contents. This table can be used to change to the help topic of a different block which does not necessarily have to exist.

The CNT file may also be included in the CNT file of another help project using an INCLUDE statement such as ":include Mylib__b.cnt". The integrated CNT file is listed in the table of contents of the other help project, provided both files are available in the same installation folder.

Multilingual Online Help

Create a separate help file for each language you may want to offer in a multilingual online help system. The file name in PCS 7 consists of eight characters of which the last is used for the language ID.

a	German	
b	English	
c	French	
d	Spanish	Currently not supported in PCS 7
e	Italian	Currently not supported in PCS 7
y	Not language-dependent	For the registry file, for example

Use the **Options > Customize > Language** dialog box to set the regional language. PCS 7 calls the help file which matches the set language using the registry (cf. chapter 3.3).

Copy the help file and any corresponding CNT file to the subfolder of the STEP 7 folder in which you install your library or the project with the blocks.

3.3 Structure of the registry file

Registry file

Open the ASCII editor to write a registry file which enters your block data in the WINDOWS registry. You can assign the registry file a user-specific name. For reasons of clarity, you should use the name of your library or a name shared by your blocks. Example: "**MYLIB__y.reg**".

Example

Example of a registry file for three blocks and five language versions (Spanish and Italian with English help text).

```
REGEDIT4

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\mylib\ABC]
"Version"="0.2"
"VersionDate"="23.11.2003"
"HelpFileGerman"="S7libs\\mylib\\MYLIB__a.hlp"
"HelpFileEnglish"="S7libs\\mylib\\MYLIB__b.hlp"
"HelpFileFrench"="S7libs\\mylib\\MYLIB__c.hlp"
"HelpFileSpanish"="S7libs\\mylib\\MYLIB__b.hlp"
"HelpFileItalian"="S7libs\\mylib\\MYLIB__b.hlp"

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\mylib\ABC\XYZ]
"CONTROL"=dword:00000010
"CONTROL2"=dword:00000011
"CONTROL3"=dword:00000012
```

Note

Faulty entries in the registry may lead to problems in program execution or prevent proper execution of the required function.

You should therefore use the registry keys as shown in this example.

Values to enter in the registry keys:

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\NameOfLibrary\Author]

The library name represents the user-specific name of your library (here: mylib). This corresponds with the name of the STEP 7 subfolder which contains your help file. CFC Editor outputs your library with this name. **Author** represents the name defined at the AUTHOR attribute in the block header (here: ABC).

Version
Contains the version number of the entire library. This entry is optional.

VersionDate
Contains the creation date of the library. This entry is optional.

Path to the help file
Contains the path relative to the STEP 7 folder for the required help file, for example:

"HelpFileGerman"="S7libs\\mylib\\MYLIB__a.hlp".

Please note that you have to enter two delimiters (\\). The program uses this entry to call the help file matching the language set in SIMATIC Manager.

Note

Italian and Spanish are currently not supported in PCS 7, so the help system is called in English language.

Next, enter the following keys:

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\Name OfLibrary \Author\Family]

Family represents the name you defined at the FAMILY attribute in the block header (here: XYZ).

Below this, you must specify the block name, as specified in the header, for each block (see Fig. 1–3) with the entry address in the Help file, for example: "CONTROL"=dword:00000010. The entry address is the number of the Topic ID

When grouping your blocks by families, insert a separate key for each family in the registry file.

After you have executed this registry file (for example, by double-click), select a block from the CFC chart or in SIMATIC Manager and then press F1. The program determines and outputs the corresponding help file based on the language setting and on the block attributes AUTHOR, FAMILY, and FUNCTION_BLOCK in the WINDOWS registry.

3.4 Special features for creating help files for SFC templates

By contrast to the information provided in chapter 3.2 and 3.3, and supplementary to this information, make allowances for the items shown below when creating online help files for SFC templates:

Storage location

Copy the help files for the SFC templates to your installation folder. It is advisable to save these to the existing "S7Hlp" folder. This folder also contains the SFC online help files. This setup ensures that you can also change to the SFC online help from the help system you created. See below. The example registry entries shown below relates to this storage location.

Key entries

Author	The "Author" entry is assigned by the SFC because this program compiles executable blocks from these SFC templates. Always: **ES_SFC**.
Family	You can view the family name in the "Family" field (no empty string) in the properties dialog box of the SFC template. In the example: **SFC**
Name	You can view the name of the SFC template in the "Name" field (no empty string) of the properties dialog box. In the example: "**Dosi1"** and **"Heat1"**

Example of a registry file for two block types and two language versions

```
Windows Registry Editor Version 5.00

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\SFCTypes]

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\SFCTypes\ES_SFC]
"HelpFileGerman"="S7Hlp\\SFC_Typa.hlp"
"HelpFileENGLISH"="S7Hlp\\SFC_Typb.hlp"
"Version"="1.1"
"VersionDate"="14.11.2003"

[HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\Applications\s7libs\SFCTypes\ES_SFC\SFC]
"Dosi1"=dword:00000888
"Heat1"=dword:00000889
```

Changing to the SFC help system

In order to be able to change to the SFC help system from the help you created, you can insert a jump to the (internal) table of contents of the SFC online help in the various topics. Syntax of this jump:

SFC help system!JumpID(`s7jsfcab.hlp',`IDH_CONTENTS')

Note

The jump address appended to the green text with double underscore → !JumpID(`s7jsfcab.hlp',`IDH_CONTENTS') is formatted as hidden text.

4 Creating a library and setup

4.1 Requirements

In order to create a complete library and the corresponding Setup functions for distribution, you need a program for the creation of installation routines such as "InstallShield".

4.2 Creating a library

Procedure

To group your blocks and/or SFC templates in a library:

1. Create a new S7 library and generate an S7 program therein
2. Enter the names and numbers of your blocks, including the corresponding comments in the symbol table of the library (this does not apply to SFC templates).
3. Sources:
   If you decide to include the source files of the blocks in your delivery, copy these from the source folder of your project to the source folder of the library
4. Blocks:
   Copy your blocks from the block folder of your project to the block folder of the library

   Note:

   - When using your multiple instance blocks to call blocks which are not generally available (SFBs, SFCs), you should also copy these to the block folder of the library.
   - Exclude blocks the compiler has generated from the SFC templates when you copy the blocks
5. SFC templates:
   Create a chart folder if you have not yet done so
   Copy the SFC templates from the chart folder of your project to the chart folder of the library

   Note:
   The blocks belonging to the SFC templates are also copied and saved to the block folder.

4.3 Create a Setup routine

Procedure

1. In order to use a Setup routine to install your library on the target computer, create an installation script using the Setup authoring tool to perform the actions outlined below:
   - Copy the block library to the **S7LIBS** subfolder of the STEP 7 folder
   - Call the **S7BIN\S7ALIBXX.EXE** program in the STEP 7 folder in order to publish the new library in SIMATIC Manager
   - Copy the help file (HLP and CNT file) to the subfolder of the STEP 7 folder to which the block library was copied (for example, subfolder **S7LIBS\MYLIB**)
   - Call the registry file belonging to the help file
   - Copy the prototype pictures to the **options\pdl** \FaceplateDesigner_V6 subfolder of the WinCC folder
   - Copying the scripts to any subfolder of the **aplib** subfolder in the WinCC folder
     This folder should preferably be assigned the same name as the folder to which the block library was copied. Example: subfolder **options\pdl\mylib**).
   - Setup of an uninstall option
2. Note that the block library and the online help system can only be installed when STEP 7 exists on the target computer The prototype pictures can only be installed in a subfolder of WinCC You should for this reason implement functions to query the existence of STEP 7 and WinCC in the installation dialog
3. You can also query the following items in the registry:
   - Query the required value of the STEP7_VERSION name ("V5.2", for example) in the key HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7
   - You can also query the version name (V6.0 SP!, for example) in HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\WinCC\Setup

A Samples: Source code of blocks MEAS_MON, MOTOR and VALVE

A.1 MEAS_MON

```
// @(#) $Header::   L:/PCS7/PCS7LibV51.SW/TechBlocks/VCS/Algorithm/meas_mon.csv$
//Copyright (C) Siemens AG 1995. All Rights Reserved. Confidential

// PCS 7 Library Vx.x
// Function: Meas.value monitoring block
// Label Version 3.0
// Macro Version :V0.92
FUNCTION_BLOCK "MEAS_MON"
TITLE = 'Meas.value monitoring block'
//
{
        S7_tasklist:=        'OB100';
        S7_alarm_ui:=       '1';
        S7_m_c:=            'true'
}
AUTHOR:              TECHN61
NAME:                MEAS_MON
VERSION:             '3.0'
FAMILY:              CONTROL
KNOW_HOW_PROTECT

VAR_INPUT
OOS  {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='In Service';
        S7_string_1:='Out of Service'} :    BOOL := 0; // 1= Out of Service
M_SUP_AH     {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='Suppress HH=No';
        S7_string_1:='Suppress HH=Yes'} :   BOOL := 0; // 1=Suppress HH Alarm
M_SUP_AL     {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='Suppress LL=No';
        S7_string_1:='Suppress LL=Yes'} :   BOOL := 0; // 1=Suppress LL Alarm
M_SUP_WH     {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='Suppress H=No';
        S7_string_1:='Suppress H=Yes'} :    BOOL := 0; // 1=Suppress H Alarm (Warning)
M_SUP_WL     {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='Suppress L=No';
        S7_string_1:='Suppress L=Yes'} :    BOOL := 0; // 1=Suppress L Alarm (Warning)
CSF  {S7_dynamic:='true'} :     BOOL := 0; // Control System Fault 1=External Error
MSG_LOCK     {S7_visible:='false';
        S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // Enable 1=Messages locked
MO_PVHR  {S7_visible:='false';
        S7_m_c:='true';
        S7_shortcut:='Bar UL';
        S7_unit:=''} :  REAL := 110;       // High Limit Bar Range
MO_PVLR  {S7_visible:='false';
        S7_m_c:='true';
        S7_shortcut:='Bar LL';
        S7_unit:=''} :  REAL := -10;       // Low Limit Bar Range
```

```
USTATUS  {S7_visible:='false'} :    WORD := 0; // User Status Bits
U    {S7_qc:='true';
       S7_dynamic:='true';
       S7_m_c:='true';
       S7_shortcut:='PV';
       S7_unit:=''} :  REAL := 0;   // Analog Input (Measured Value)
QC_U : BYTE := 16#80;               // Quality Code for Input U
U_AH     {S7_link:='false';
       S7_edit:='para';
       S7_m_c:='true';
       S7_shortcut:='HH alarm';
       S7_unit:=''} :  REAL := 100; // HH Alarm Limit
U_WH     {S7_link:='false';
       S7_edit:='para';
       S7_m_c:='true';
       S7_shortcut:='H alarm';
       S7_unit:=''} :  REAL := 95;  // H Alarm Limit (Warning)
U_WL     {S7_link:='false';
       S7_edit:='para';
       S7_m_c:='true';
       S7_shortcut:='L alarm';
       S7_unit:=''} :  REAL := -3;  // L Alarm Limit (Warning)
U_AL     {S7_link:='false';
       S7_edit:='para';
       S7_m_c:='true';
       S7_shortcut:='LL alarm';
       S7_unit:=''} :  REAL := -5;  // LL Alarm Limit
HYS  {S7_link:='false';
       S7_m_c:='true';
       S7_shortcut:='Hysteresis';
       S7_unit:=''} :  REAL := 5;   // Hysteresis of Analog Input
MSG_EVID     {S7_visible:='false';
       S7_link:='false';
       S7_param :='false';
       S7_server:='alarm_archiv';S7_a_type:='alarm_8p'} :  DWORD := 0; // Message ID
BA_EN    {S7_visible:='false';
       S7_m_c:='true'} :   BOOL := 0;        // Batch Enable
OCCUPIED     {S7_visible:='false';
       S7_m_c:='true'} :   BOOL := 0;        // Occupied by Batch
BA_ID    {S7_visible:='false';
       S7_m_c:='true'} :   DWORD := 0;       // Batch ID
BA_NA    {S7_visible:='false';
       S7_m_c:='true'} :   STRING[32] := ''; // Batch Name
STEP_NO  {S7_visible:='false';
       S7_m_c:='true'} :   DWORD := 0;       // Batch Step Number
RUNUPCYC     {S7_visible:='false';
       S7_link:='false'} :     INT := 3;     // Number of Run Up Cycles
END_VAR

VAR_IN_OUT
AUX_PR05     {S7_visible:='false'} :    ANY; // Auxiliary Value 5
AUX_PR06     {S7_visible:='false'} :    ANY; // Auxiliary Value 6
AUX_PR07     {S7_visible:='false'} :    ANY; // Auxiliary Value 7
AUX_PR08     {S7_visible:='false'} :    ANY; // Auxiliary Value 8
AUX_PR09     {S7_visible:='false'} :    ANY; // Auxiliary Value 9
AUX_PR10     {S7_visible:='false'} :    ANY; // Auxiliary Value 10
END_VAR

VAR_OUTPUT
QERR     {S7_visible:='false';
       S7_m_c:='true'} :   BOOL := 1; // 1=Error
QH_ALM   {S7_dynamic:='true'} :     BOOL := 0; // 1=HH-Alarm active
QL_ALM   {S7_dynamic:='true'} :     BOOL := 0; // 1=LL Alarm active
QH_WRN   {S7_dynamic:='true'} :     BOOL := 0; // 1=H Alarm active (Warning)
QL_WRN   {S7_dynamic:='true'} :     BOOL := 0; // 1=L Alarm active (Warning)
QMSG_ERR     {S7_visible:='false';
       S7_dynamic:='true'} :   BOOL := 0;     // 1=Message ERROR
QMSG_SUP     {S7_visible:='false';
       S7_dynamic:='true';
       S7_m_c:='true'} :   BOOL := 0;         // 1=Message Suppression Active
MSG_STAT     {S7_visible:='false';
       S7_dynamic:='true'} :   WORD := 0;     // Message: STATUS output
MSG_ACK  {S7_visible:='false';
       S7_dynamic:='true'} :   WORD := 0;     // Message: ACK_STATE output
VSTATUS  {S7_visible:='false';
       S7_m_c:='true'} :   DWORD := 0;        // Status word
END_VAR
```

```
CONST
C_OOS := 0;        // 1= Out of Service
C_M_SUP_AH := 0;   // 1=Suppress HH Alarm
C_M_SUP_AL := 0;   // 1=Suppress LL Alarm
C_M_SUP_WH := 0;   // 1=Suppress H Alarm (Warning)
C_M_SUP_WL := 0;   // 1=Suppress L Alarm (Warning)
C_CSF := 0;        // Control System Fault 1=External Error
C_MSG_LOCK := 0;   // Enable 1=Messages locked
C_MO_PVHR := 110;  // High Limit Bar Range
C_MO_PVLR := -10;  // Low Limit Bar Range
C_USTATUS := 0;    // User Status Bits
C_U := 0;          // Analog Input (Measured Value)
C_QC_U := 16#80;   // Quality Code for Input U
C_U_AH := 100;     // HH Alarm Limit
C_U_WH := 95;      // H Alarm Limit (Warning)
C_U_WL := -3;      // L Alarm Limit (Warning)
C_U_AL := -5;      // LL Alarm Limit
C_HYS := 5;        // Hysteresis of Analog Input
C_AUX_PR05 := 0;   // Auxiliary Value 5
C_AUX_PR06 := 0;   // Auxiliary Value 6
C_AUX_PR07 := 0;   // Auxiliary Value 7
C_AUX_PR08 := 0;   // Auxiliary Value 8
C_AUX_PR09 := 0;   // Auxiliary Value 9
C_AUX_PR10 := 0;   // Auxiliary Value 10
C_MSG_EVID := 0;   // Message ID
C_BA_EN := 0;      // Batch Enable
C_OCCUPIED := 0;   // Occupied by Batch
C_BA_ID := 0;      // Batch ID
C_BA_NA := '';     // Batch Name
C_STEP_NO := 0;    // Batch Step Number
C_RUNUPCYC := 3;   // Lag: Number of Run Up Cycles
C_QERR := 1;       // 1=Error
C_QH_ALM := 0;     // 1=HH-alarm Active
C_QL_ALM := 0;     // 1=LL Alarm Active
C_QH_WRN := 0;     // 1=H Alarm active (Warning)
C_QL_WRN := 0;     // 1=L Alarm Active (Warning)
C_QMSG_ERR := 0;   // 1=Message ERROR
C_QMSG_SUP := 0;   // 1=Message Suppression Active
C_MSG_STAT := 0;   // Message: STATUS Output
C_MSG_ACK := 0;    // Message: ACK_STATE output
C_VSTATUS := 0;    // Status word
END_CONST

// Static Variables
VAR
siRUNUPCNT:    int := 0;   // Counter for RUNUPCYC editing
 sb_SIG_1: bool    := FALSE;   //Merker ALARM_8P Signal 1
 sb_SIG_2: bool    := FALSE;   //Merker ALARM_8P Signal 2
 sb_SIG_3: bool    := FALSE;   //Merker ALARM_8P Signal 3
 sb_SIG_4: bool    := FALSE;   //Merker ALARM_8P Signal 4
 sb_SIG_5: bool    := FALSE;   //Merker ALARM_8P Signal 5
ALARM_8P_1:    ALARM_8P;   // Multiple instance ALARM_8P
siBA_ID:   dword := 0;     // Old value BA_ID
sbyBA_NA:  array[1..32] of byte := 32(0);
VSTATUS_LOC : DWORD :=16#0;// Local static variable, in which the output VSTATUS
                           // is copied.
STEP_NO_LOC : DWORD;       // Local variable, in which the input STEP_NO is
                           // saved.
PV_IN_LOC : REAL;          // Local variable, in which the input PV_IN is saved.
dwDUMMY:    DWORD := 0;    // Stand-by
BA_ID_LOC : DWORD;         // Local static variable, in which the input BA_ID
                           // is copied.
U_LOC : REAL;  // Local static variable, in which the input U is copied, because of
               // message in ALARM_8P

// Variables for the status word "VSTATUS" and "USTATUS"
VSTATUS_STR AT VSTATUS_LOC :  STRUCT
                                USTATUS : WORD;
                                VSTATUS_LOW_BIT_8 : BOOL;
                                VSTATUS_LOW_BIT_9 : BOOL;
                                VSTATUS_LOW_BIT_10 : BOOL;
                                VSTATUS_LOW_BIT_11 : BOOL;
                                VSTATUS_LOW_BIT_12 : BOOL;
                                VSTATUS_LOW_BIT_13 : BOOL;
                                VSTATUS_LOW_BIT_14 : BOOL;
                                VSTATUS_LOW_BIT_15 : BOOL;
                                VSTATUS_LOW_BIT_0 : BOOL;
                                VSTATUS_LOW_BIT_1 : BOOL;
                                VSTATUS_LOW_BIT_2 : BOOL;
                                VSTATUS_LOW_BIT_3 : BOOL;
                                VSTATUS_LOW_BIT_4 : BOOL;
                                VSTATUS_LOW_BIT_5 : BOOL;
```

```
                                VSTATUS_LOW_BIT_6 : BOOL;
                                VSTATUS_LOW_BIT_7 : BOOL;
                              END_STRUCT;
END_VAR

// Temporary Variables
VAR_TEMP
 pbALARM:  BOOL;       // Call up ALARM_8P
 pbM_SUP:  BOOL;       // Message suppression
 pb_SIG_1,pb_SIG_2,pb_SIG_3,pb_SIG_4:BOOL;
TOP_SI:    STRUCT
   EV_CLASS:   BYTE;
   EV_NUM:     BYTE;
   PRIORITY:   BYTE;
   NUM:        BYTE;
   TYP2_3:     BYTE;
   TYP1:       BYTE;
   ZI1:        WORD;
   ZI2_3:      DWORD;
   END_STRUCT;
START_UP_SI:   STRUCT
   EV_CLASS:   BYTE;
   EV_NUM:     BYTE;
   PRIORITY:   BYTE;
   NUM:        BYTE;
   TYP2_3:     BYTE;
   TYP1:       BYTE;
   ZI1:        WORD;
   ZI2_3:      DWORD;
   END_STRUCT;
 ERR :     INT;    // Error at startup
END_VAR

BEGIN
    // Write VSTATUS, STEP_NO resave as STEP_NO_LOC and
      // BA_ID resave as BA_ID_LOC.
    // Supply of VSTATUS output variables with the inputs.
    VSTATUS_STR.VSTATUS_LOW_BIT_0 := OCCUPIED;
    VSTATUS_STR.VSTATUS_LOW_BIT_1 := BA_EN;
    VSTATUS_STR.VSTATUS_LOW_BIT_2 := MSG_LOCK;
    // Supply of VSTATUS output variables (HIGH BYTE) with the values,
      // which come from the user via the input variable USTATUS (from external).
    VSTATUS_STR.USTATUS := USTATUS;
    STEP_NO_LOC := STEP_NO; // Resave, due to output of STEP_NO_LOC in ALARM_8P
    BA_ID_LOC := BA_ID;     // Resave, due to output of BA_ID_LOC in ALARM_8P
    U_LOC := U;             // Resave, due to output of U_LOC in ALARM_8P
    ERR := RD_SINFO (TOP_SI := TOP_SI, START_UP_SI := START_UP_SI);
    // Read out start info
    pbM_SUP := MSG_LOCK;
    IF TOP_SI.NUM = 100   THEN     // When startup
        siRUNUPCNT := RUNUPCYC;    // Saving the value of the RUNUPCYC input
        // Initialization outputs
        QMSG_ERR := C_QMSG_ERR;
        QMSG_SUP := C_QMSG_SUP;
        MSG_STAT := C_MSG_STAT;
        MSG_ACK  := C_MSG_ACK;
        QH_WRN := C_QH_WRN;
        QL_WRN := C_QL_WRN;
        QH_ALM := C_QH_ALM;
        QL_ALM := C_QL_ALM;
        // pbALARM := NOT OOS; // Initialization first call ALARM_8P
        pb_SIG_1:= QH_ALM;     // Alarm high
        pb_SIG_2:= QH_WRN;     // Warning high
        pb_SIG_3:= QL_WRN;     // Warning low
        pb_SIG_4:= QL_ALM;     // Alarm low
        pbALARM :=TRUE;        // Initialization ALARM
    ELSE;
        // LIMITS_P.1 für Alarmprüfung (optimiert)
        IF (U <= U_AL) THEN            // Low limit responded
            QL_ALM := TRUE;
        ELSE;
            IF (U >= (U_AL+HYS)) THEN  // Reset low limit responded
                QL_ALM := FALSE;
            ELSE;                      // QL_ALM remains unchanged
```

```
        END_IF;
    END_IF;
    IF (U >= U_AH) THEN             // High limit responded
                    QH_ALM := TRUE;
    ELSE;
        IF (U <= (U_AH-HYS)) THEN // Reset high limit responded
            QH_ALM := FALSE;
        ELSE;                       // QH_ALM remains unchanged
        END_IF;
    END_IF;
    // LIMITS_P.2 for Warning check (optimized)
    IF (U <= U_WL) THEN             // Low limit responded
        QL_WRN := TRUE;
    ELSE;
        IF (U >= (U_WL+HYS)) THEN // Reset low limit responded
            QL_WRN := FALSE;
        ELSE;                       // QL_WRN remains unchanged
        END_IF;
    END_IF;
    IF (U >= U_WH) THEN             // High limit responded
        QH_WRN := TRUE;
    ELSE;
        IF (U <= (U_WH-HYS)) THEN // Reset high limit responded
            QH_WRN := FALSE;
        ELSE;                       // QH_WRN remains unchanged
        END_IF;
    END_IF;
    IF siRUNUPCNT = 0  THEN         // Initialize alarms
        IF M_SUP_AH OR MSG_LOCK THEN
            pb_SIG_1:= 0;           // Report possible outgoing
        ELSE;
            pb_SIG_1:= QH_ALM;      // Alarm high
        END_IF;
        IF M_SUP_WH OR MSG_LOCK THEN
            pb_SIG_2:= 0;           // Report possible outgoing
        ELSE;
            pb_SIG_2:= QH_WRN;      // Warning high
        END_IF;
        IF M_SUP_WL OR MSG_LOCK THEN
            pb_SIG_3:= 0;           // Report possible outgoing
        ELSE;
            pb_SIG_3:= QL_WRN;      // Warning low
        END_IF;
        IF M_SUP_AL OR MSG_LOCK THEN
            pb_SIG_4:= 0;           // Report possible outgoing
        ELSE;
            pb_SIG_4:= QL_ALM;      // Alarm low
        END_IF;
        // pbALARM := (sb_SIG_1 <> pb_SIG_1) OR (sb_SIG_2 <>  pb_SIG_2)
          // OR (sb_SIG_3 <>  pb_SIG_3) OR (sb_SIG_4 <>  pb_SIG_4)
            // OR (sb_SIG_5 <>  CSF);
        pbALARM :=TRUE;             // Initialization ALARM
    ELSE;
        pbALARM :=FALSE;            // Initialization no ALARM
        pbM_SUP := TRUE;
        siRUNUPCNT := siRUNUPCNT - 1;
    END_IF;
END_IF;
IF pbALARM  THEN                    // Call up ALARM_8P
    IF siBA_ID <> BA_ID_LOC THEN
        // STRING variables may not be interconnected to ALARM8_P as auxiliary
          //process values, therefore transferred in ARRAY OF BYTE.
        FOR ERR := 1 TO 32
         DO
            sbyBA_NA[ERR] := 0;     // Delete array as default
        END_FOR;
        ERR := BLKMOV (SRCBLK:= BA_NA,DSTBLK:=sbyBA_NA);
        siBA_ID := BA_ID_LOC;       // Save modified BA_ID
    END_IF;
    // Call ALARM_8P with lock logic (MSG_LOCK).
    ALARM_8P_1(    EN_R := TRUE,  // Update the ACKL_STATE output
                   ID := 16#EEEE, // PMC communication channel
       EV_ID:= MSG_EVID,
       SIG_1:= pb_SIG_1,
       SIG_2:= pb_SIG_2,
       SIG_3:= pb_SIG_3,
       SIG_4:= pb_SIG_4,
       SIG_5:= CSF,
       SIG_6:= 0,
       SIG_7:= 0,
       SIG_8:= 0,
       SD_1 := sbyBA_NA,
```

```
            SD_2 := STEP_NO_LOC,
            SD_3 := BA_ID_LOC,
            SD_4 := U_LOC,
            SD_5 := AUX_PR05,
            SD_6 := AUX_PR06,
            SD_7 := AUX_PR07,
            SD_8 := AUX_PR08,
            SD_9 := AUX_PR09,
            SD_10 := AUX_PR10);
        QMSG_ERR := ALARM_8P_1.ERROR;
        MSG_STAT := ALARM_8P_1.STATUS;
        MSG_ACK := ALARM_8P_1.ACK_STATE;
        IF (NOT QMSG_ERR) THEN        // Note historical signals.
            sb_SIG_1:= pb_SIG_1;
            sb_SIG_2:= pb_SIG_2;
            sb_SIG_3:= pb_SIG_3;
            sb_SIG_4:= pb_SIG_4;
            sb_SIG_5:= CSF;
        END_IF;
    END_IF;
    IF (MSG_STAT = 21) THEN           // Block locked
        pbM_SUP := TRUE;
    END_IF;
    QMSG_SUP := pbM_SUP;
    QERR := NOT OK;                   // Note negated OK-Flag result in the block.
    // Power supply of the VSTATUS output variable with the outputs.
    VSTATUS_STR.VSTATUS_LOW_BIT_14 := QMSG_SUP OR M_SUP_AH OR M_SUP_WH OR M_SUP_WL OR
M_SUP_AL ;
    VSTATUS_STR.VSTATUS_LOW_BIT_15 := OOS;
    VSTATUS := VSTATUS_LOC;
END_FUNCTION_BLOCK
```

A.2 MOTOR

```
// @(#) $Header::   L:/PCS7/PCS7LibV51.SW/TechBlocks/VCS/Algorithm/motor.csv   $
//Copyright (C) Siemens AG 1995-1997. All Rights Reserved. Confidential

PCS 7 Library Vx.x
// Function: motor
// Label Version 3.0
// Macro Version :V0.92

FUNCTION_BLOCK "MOTOR"
TITLE = 'motor '
//
{
        S7_tasklist:=        'OB100';
        S7_alarm_ui:=       '1';
        S7_m_c:=            'true'
}
AUTHOR:              TECHN61
NAME:                MOTOR
VERSION:             '4.0'
FAMILY:              CONTROL
KNOW_HOW_PROTECT

VAR_INPUT
OOS   {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='In Service';
        S7_string_1:='Out of Service'} :    BOOL := 0; // 1= Out of Service
LOCK     {S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // 1=Lock to OFF
LOCK_ON  {S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // 1=Lock to ON
AUTO_ON  {S7_dynamic:='true';
        S7_contact:='true'} :   BOOL := 0; // AUTO Mode:1=ON, 0=OFF
L_RESET  {S7_dynamic:='true';
        S7_contact:='true'} :   BOOL := 0; // Linkable Input RESET
MSS   {S7_dynamic:='true'} :     BOOL := 1; // Motor Protecting Switch: 0=Active
CSF   {S7_dynamic:='true'} :     BOOL := 0; // Control System Fault 1=External Error
FB_ON    {S7_qc:='true';
        S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0; // Feedback: 1=ON
QC_FB_ON : BYTE := 16#80;              // Quality Code for FB_ON
QC_QSTART_I : BYTE := 16#80;           // Quality Code for Input QSTART
ON_OP_EN   {S7_visible:='false'} :   BOOL := 1; // Enable 1=Operator may input "ON"
OFFOP_EN   {S7_visible:='false'} :   BOOL := 1; // Enable 1=Operator for "OFF"
MANOP_EN   {S7_visible:='false'} :   BOOL := 1; // Enable: 1=Operator may input "MANUAL"
AUTOP_EN   {S7_visible:='false'} :   BOOL := 1; // Enable: 1=Operator may input "AUTO"
LIOP_SEL   {S7_dynamic:='true';
        S7_contact:='true'} :   BOOL := 0; // Select: 1=Linking, 0=Operator Active
AUT_L    {S7_dynamic:='true';
        S7_contact:='true'} :   BOOL := 0; // Linkable Input for  MANUAL/AUTO Mode
MONITOR  {S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='Monitoring=Off';
        S7_string_1:='Monitoring=On'} :     BOOL := 1;  // Select: 1=Monitoring ON,
                                                        // 0=Monitoring OFF
TIME_MON     {S7_link:='false';
        S7_edit:='para';
        S7_m_c:='true';
        S7_shortcut:='Mon. Time';
        S7_unit:='s'} :    REAL := 3;          // Monitoring Time for ON [s]
SAMPLE_T     {S7_visible:='false';
        S7_sampletime:='true'} :    REAL := 1; // Sample Time [s]
MSG_EVID     {S7_visible:='false';
        S7_link:='false';
        S7_param :='false';
        S7_server:='alarm_archiv';S7_a_type:='alarm_8p'} :  DWORD := 0; // Message ID
BA_EN    {S7_visible:='false';
        S7_m_c:='true'} :   BOOL := 0;        // Batch Enable
OCCUPIED     {S7_visible:='false';
        S7_m_c:='true'} :   BOOL := 0;        // Occupied by Batch
```

```
BA_ID    {S7_visible:='false';
         S7_m_c:='true'} :     DWORD := 0;      // Batch ID
BA_NA    {S7_visible:='false';
         S7_m_c:='true'} :   STRING[32] := ''; // Batch Name
STEP_NO  {S7_visible:='false';
         S7_m_c:='true'} :   DWORD := 0;       // Batch Step Number
RUNUPCYC     {S7_visible:='false';
         S7_link:='false'} :     INT := 3; // Lag: Number of Run Up Cycles
START_OFF    {S7_visible:='false'} :    BOOL := 1; // 1=Start up with Motor OFF
FAULT_OFF    {S7_visible:='false'} :    BOOL := 1; // 1=In case of Fault: Motor OFF
MSS_OFF  {S7_visible:='false'} :    BOOL := 1; // 1=In case of MSS-Fault: Motor OFF
USTATUS  {S7_visible:='false'} :    WORD := 0; // User STATUS Bits
END_VAR

VAR_IN_OUT
RESET    {S7_visible:='false';
         S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='0';
         S7_string_1:='Error=Reset'} :   BOOL := 0; // Operator Input Error Reset
MAN_ON   {S7_visible:='false';
         S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='Motor=Stop';
         S7_string_1:='Motor=Start'} :   BOOL := 0; // Operator Input: 1=ON, 0=OFF
AUT_ON_OP    {S7_visible:='false';
         S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='Mode=Manual';
         S7_string_1:='Mode=Auto'} :     BOOL := 0; // Operator Input Mode 1=AUTO,
                                                    // 0= MANUAL
AUX_PR04     {S7_visible:='false'} :    ANY; // Auxiliary Value 4
AUX_PR05     {S7_visible:='false'} :    ANY; // Auxiliary Value 5
AUX_PR06     {S7_visible:='false'} :    ANY; // Auxiliary Value 6
AUX_PR07     {S7_visible:='false'} :    ANY; // Auxiliary Value 7
AUX_PR08     {S7_visible:='false'} :    ANY; // Auxiliary Value 8
AUX_PR09     {S7_visible:='false'} :    ANY; // Auxiliary Value 9
AUX_PR10     {S7_visible:='false'} :    ANY; // Auxiliary Value 10
END_VAR

VAR_OUTPUT
QERR     {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 1; // 1=Error
QMSS_ST  {S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // Unacknowledged Motor Protective Switch
QMON_ERR     {S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // 1=Monitoring Error
QGR_ERR  {S7_dynamic:='true';
         S7_contact:='true'} :   BOOL := 0; // 1=Group Error
QOP_ERR  {S7_visible:='false';
         S7_dynamic:='true'} :   BOOL := 0; // 1=Operator Error
QRUN     {S7_dynamic:='true';
         S7_contact:='true';
         S7_m_c:='true'} :   BOOL := 0; // Status: 1=Motor running
QSTOP    {S7_dynamic:='true';
         S7_contact:='true';
         S7_m_c:='true'} :   BOOL := 0; // Status: 1=Motor STOP
QSTART   {S7_qc:='true';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // Control Output 1=START Active
QC_QSTART : BYTE := 16#80; // Quality Code for Output QSTART
QON_OP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // Status: 1=Operator enabled for "ON"
QOFF_OP  {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // Status: 1=Operator enabled for "OFF"
QMAN_AUT     {S7_dynamic:='true';
         S7_contact:='true';
         S7_m_c:='true'} :   BOOL := 0; // 1=AUTO, 0=MANUAL Mode
QMANOP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // Status: 1=Oper. ena. for "MANUAL" Mode
```

```
QAUTOP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0; // Status: 1=Operator enabled for "AUTO"
QMSG_ERR     {S7_visible:='false';
         S7_dynamic:='true'} :   BOOL := 0; // 1=Message ERROR
QMSG_SUP     {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;     // 1=Message Suppression Active
MSG_STAT     {S7_visible:='false';
         S7_dynamic:='true'} :   WORD := 0; // Message: STATUS Output
MSG_ACK  {S7_visible:='false';
         S7_dynamic:='true'} :   WORD := 0; // Message: ACK_STATE output
VSTATUS  {S7_visible:='false';
         S7_m_c:='true'} :   DWORD := 0;    // Status word
END_VAR

CONST
C_OOS := 0;              // 1= Out of Service
C_LOCK := 0;             // 1=Lock to OFF
C_LOCK_ON := 0;          // 1=Lock to ON
C_AUTO_ON := 0;          // AUTO Mode:1=ON, 0=Off
C_RESET := 0;            // Operator Input Error Reset
C_L_RESET := 0;          // Linkable Input RESET
C_MSS := 1;              // Motor Protecting Switch: 0=Active
C_CSF := 0;              // Control System Fault 1=External Error
C_FB_ON := 0;            // Feedback: 1=ON
C_QC_FB_ON := 16#80;     // Quality Code for FB_ON
C_QC_QSTART_I := 16#80; // Quality Code for Input QSTART
C_MAN_ON := 0;           // Operator Input: 1=ON, 0=OFF
C_ON_OP_EN := 1;         // Enable 1=Operator may input ON
C_OFFOP_EN := 1;         // Enable 1=Operator for "OFF"
C_AUT_ON_OP := 0;        // Operator Input Mode 1=AUTO, 0= MANUAL
C_MANOP_EN := 1;         // Enable: 1=Operator may input MANUAL
C_AUTOP_EN := 1;         // Enable: 1=Operator may input AUTO
C_LIOP_SEL := 0;         // Select: 1=Linking, 0=Operator Active
C_AUT_L := 0;            // Linkable Input for  MANUAL/AUTO Mode
C_MONITOR := 1;          // Select: 1=Monitoring ON, 0=Monitoring OFF
C_TIME_MON := 3;         // Monitoring Time for ON [s]
C_SAMPLE_T := 1;         // Sample Time [s]
C_AUX_PR04 := 0;         // Auxiliary Value 4
C_AUX_PR05 := 0;         // Auxiliary Value 5
C_AUX_PR06 := 0;         // Auxiliary Value 6
C_AUX_PR07 := 0;         // Auxiliary Value 7
C_AUX_PR08 := 0;         // Auxiliary Value 8
C_AUX_PR09 := 0;         // Auxiliary Value 9
C_AUX_PR10 := 0;         // Auxiliary Value 10
C_MSG_EVID := 0;         // Message ID
C_BA_EN := 0;            // Batch Enable
C_OCCUPIED := 0;         // Occupied by Batch
C_BA_ID := 0;            // Batch ID
C_BA_NA := '';           // Batch Name
C_STEP_NO := 0;          // Batch Step Number
C_RUNUPCYC := 3;         // Lag: Number of Run Up Cycles
C_START_OFF := 1;        // 1=Start up with Motor OFF
C_FAULT_OFF := 1;        // 1=In case of fault: Motor OFF
C_MSS_OFF := 1;          // 1=In case of MSS fault: Motor OFF
C_USTATUS := 0;          // User STATUS Bits
C_QERR := 1;             // 1=Error
C_QMSS_ST := 0;          // Unacknowledged Motor Protective Switch
C_QMON_ERR := 0;         // 1=Monitoring Error
C_QGR_ERR := 0;          // 1=Group Error
C_QOP_ERR := 0;          // 1=Operator Error
C_QRUN := 0;             // Status: 1=Motor running
C_QSTOP := 0;            // Status: 1=Motor STOP
C_QSTART := 0;           // Control Output 1=START Active
C_QC_QSTART := 16#80;    // Quality Code for Output QSTART
C_QON_OP := 0;           // Status: 1=Operator enabled for "ON"
C_QOFF_OP := 0;          // Status: 1=Operator enabled for "OFF"
C_QMAN_AUT := 0;         // 1=AUTO, 0=MANUAL Mode
C_QMANOP := 0;           // Status: 1=Oper. enabled for "MANUAL" Mode
C_QAUTOP := 0;           // Status: 1=Operator enabled for "AUTO" Mode
C_QMSG_ERR := 0;         // 1=Message ERROR
C_QMSG_SUP := 0;         // 1=Message Suppression Active
C_MSG_STAT := 0;         // Message: STATUS Output
C_MSG_ACK := 0;          // Message: ACK_STATE output
C_VSTATUS := 0;          // Status word
END_CONST
```

```
// Static Variables
VAR
sbI_OD1:        BOOL := 0;       // Flag of old operating value for OP_D.1
sbI_OD2:        BOOL := 0;       // Flag of old operating value for OP_D.2
sbQ_OD1:        BOOL := 0;       // Binary output for OP_D.1
sbALT_LINK_I_OT1:  BOOL := 0;  // Old value of interconnectable input for OP_TRIG.1
sbALT_QSTART:      BOOL := 0;  // Historical process data for QSTART
 sb_SIG_1: BOOL     := FALSE;   // ALARM_8P signal 1 flag
 sb_SIG_2: BOOL     := FALSE;   // ALARM_8P signal 2 flag
 sb_SIG_3: BOOL     := FALSE;   // ALARM_8P signal 3 flag
srAktZeit:      REAL := 0;       // Time passed
siRUNUPCNT:         INT  := 0;  // Counter for RUNUPCYC editing

//------------------------ ALARM_8P.1 -----------------------------
ALARM_8P_1:         ALARM_8P;   // Multiple instanced ALARM_8P
dwDUMMY:    DWORD := 0;         // Stand-by
siBA_ID:   DWORD := 0;          // Old value BA_ID
sbyBA_NA:  ARRAY[1..32] OF BYTE := 32(0);

VSTATUS_LOC : DWORD :=16#0;  // Local variable, into which the VSTATUS output is copied
STEP_NO_LOC : DWORD;         // Local variable, into which the STEP_NO input is copied
BA_ID_LOC : DWORD;           // Local variable, into which the BA_ID input is copied

// Variables for STATUSWORT "VSTATUS" and "USTATUS"
VSTATUS_STR AT VSTATUS_LOC :  STRUCT
                                USTATUS : WORD;
                                VSTATUS_LOW_BIT_8 : BOOL;
                                VSTATUS_LOW_BIT_9 : BOOL;
                                VSTATUS_LOW_BIT_10 : BOOL;
                                VSTATUS_LOW_BIT_11 : BOOL;
                                VSTATUS_LOW_BIT_12 : BOOL;
                                VSTATUS_LOW_BIT_13 : BOOL;
                                VSTATUS_LOW_BIT_14 : BOOL;
                                VSTATUS_LOW_BIT_15 : BOOL;
                                VSTATUS_LOW_BIT_0 : BOOL;
                                VSTATUS_LOW_BIT_1 : BOOL;
                                VSTATUS_LOW_BIT_2 : BOOL;
                                VSTATUS_LOW_BIT_3 : BOOL;
                                VSTATUS_LOW_BIT_4 : BOOL;
                                VSTATUS_LOW_BIT_5 : BOOL;
                                VSTATUS_LOW_BIT_6 : BOOL;
                                VSTATUS_LOW_BIT_7 : BOOL;
                               END_STRUCT;
END_VAR

// Temporary variables
VAR_TEMP
TOP_SI:    STRUCT
   EV_CLASS:    BYTE;
   EV_NUM:      BYTE;
   PRIORITY:    BYTE;
   NUM:         BYTE;
   TYP2_3:      BYTE;
   TYP1:        BYTE;
   ZI1:         WORD;
   ZI2_3:       DWORD;
   END_STRUCT;
START_UP_SI:    STRUCT
   EV_CLASS:    BYTE;
   EV_NUM:      BYTE;
   PRIORITY:    BYTE;
   NUM:         BYTE;
   TYP2_3:      BYTE;
   TYP1:        BYTE;
   ZI1:         WORD;
   ZI2_3:       DWORD;
   END_STRUCT;
ERR :             INT;            // Startup error
pbLINK_ON_OD1:    BOOL;           // Operating/Interconnection flag for OP_D.1.
pbLINK_I_OD1:     BOOL;           // Interconnectable input for OP_D.1.
pbQOP_ERR:        BOOL;           // Operating error pointer for OP_D.1.
pbLINK_I_OT1:     BOOL;           // Interconnectable input for OP_TRIG.1.
pbQ_OT1:          BOOL;           // Binary output for OP_TRIG.1.
pbALARM:          BOOL;           // Call up ALARM_8P
pbM_SUP:          BOOL;           // Message suppression
END_VAR
```

```
BEGIN
    // Supply of the VSTATUS, resave STEP_NO as STEP_NO_LOC,
      // Resave BA_ID as BA_ID_LOC
    // Supply of the VSTATUS output variable with the inputs.
    VSTATUS_STR.VSTATUS_LOW_BIT_0 := OCCUPIED;
    VSTATUS_STR.VSTATUS_LOW_BIT_1 := BA_EN;
    // Supply of the VSTATUS output variable (HIGH BYTE) with the values
      // that come from the user via the input variable USTATUS (from external).
    VSTATUS_STR.USTATUS := USTATUS;
    // Resave STEP_NO as STEP_NO_LOC and resave BA_ID as BA_ID_LOC
    STEP_NO_LOC := STEP_NO; // Resave, due to output of STEP_NO_LOC in ALARM_8P
    BA_ID_LOC := BA_ID;     // Resave, due to output of BA_ID_LOC in ALARM_8P
    ERR := RD_SINFO (TOP_SI := TOP_SI, START_UP_SI := START_UP_SI); // Read out
                                                                    // start info
    // pbM_SUP := FALSE;
    IF (TOP_SI.NUM = 100) AND START_OFF THEN
        siRUNUPCNT := RUNUPCYC;     // Save the value of the RUNUPCYC input
        // Initial states
        // Outputs to be set
        RESET     := C_RESET;
        MAN_ON    := C_MAN_ON;
        AUT_ON_OP := C_AUT_ON_OP;
        QERR      := C_QERR;
        QMSS_ST   := C_QMSS_ST;
        QMON_ERR  := C_QMON_ERR;
        QGR_ERR   := C_QGR_ERR;
        QOP_ERR   := C_QOP_ERR;
        QRUN      := C_QRUN;
        QSTOP     := C_QSTOP;
        QSTART    := C_QSTART;
        QC_QSTART := QC_QSTART_I; // Quality output described with value of input
        QON_OP    := C_QON_OP;
        QOFF_OP   := C_QOFF_OP;
        QMAN_AUT  := C_QMAN_AUT;
        QMANOP    := C_QMANOP;
        QAUTOP    := C_QAUTOP;
        QMSG_ERR  := C_QMSG_ERR;
                                    // QMSG_SUP := C_QMSG_SUP;
        MSG_STAT  := C_MSG_STAT;
        MSG_ACK   := C_MSG_ACK;
        // Static variables to be set
        sbI_OD1 := C_MAN_ON;         // Reset flag of old operating value for OP_D.1.
                                       // to zero
        sbI_OD2 := C_AUT_ON_OP;      // Reset flag of old operating value for OP_D.2.
                                       // to zero
        sbQ_OD1 := 0;                // Has to be set for incorrect operator
        sbALT_LINK_I_OT1 := L_RESET; // Previous value set by LINK_I
        sbALT_QSTART := C_QSTART;    // Set previous STOP-Modi
        srAktZeit := 0;              // Set acttime to NULL (zero)
        pbALARM :=TRUE;              // Initialization ALARM_8P
    ELSE;
        // MOTOR Algorithm
        // OP_D.2        Select manual or automatic mode
        pbQOP_ERR := FALSE; // Is only set to 1 in fault scenarios
        IF LIOP_SEL THEN
            // Interconnection
            IF AUT_ON_OP = sbI_OD2 THEN
                ;// No  operation occurs
            ELSE;
                pbQOP_ERR := TRUE;  // Prohibited operator
            END_IF;
            AUT_ON_OP := AUT_L;
            // Write AUT_L back to operator input
            QMAN_AUT := AUT_L;  // Interconnection
            QMANOP := FALSE;    // No operator allowed
            QAUTOP := FALSE;
        ELSE;
            // Operator
            IF (sbI_OD2 <> AUT_ON_OP) AND
               NOT ((AUT_ON_OP AND AUTOP_EN) OR (NOT(AUT_ON_OP) AND MANOP_EN)) THEN
                // Prohibited operator
                pbQOP_ERR := TRUE;
                AUT_ON_OP := sbI_OD2;
            ELSE;                // No or allowed operator
                QMAN_AUT := AUT_ON_OP;
            END_IF;
            QMANOP := MANOP_EN;
            // Copy the inputs to the outputs
            QAUTOP := AUTOP_EN;
        END_IF;
```

```
sbI_OD2 := AUT_ON_OP;                // Note old operating values
// OP_TRIG.1.
pbLINK_I_OT1 := L_RESET AND MSS;     // Link_I for OP_TRIG.1.( RESET )
// Activating RESET
pbQ_OT1 := FALSE;                    // Reset Q
IF ( pbLINK_I_OT1 AND ( NOT sbALT_LINK_I_OT1 ) )   THEN
    pbQ_OT1 := TRUE;                 // Set pbQ_OT1
ELSE;
    IF RESET THEN
        pbQ_OT1 := TRUE;             // Set pbQ_OT1
    END_IF;
END_IF;
sbALT_LINK_I_OT1 := pbLINK_I_OT1;    // Save previous values
RESET := FALSE;
// Motor protector circuit-breaker
// Establish motor protector circuit-breaker
QMSS_ST := QMSS_ST AND (NOT pbQ_OT1) OR (NOT MSS);
// Watchdog   - 1 -
IF pbQ_OT1  THEN          // If RESET came in this cycle,
                          // The monitor error has to be corrected
    QMON_ERR := 0;
END_IF;
// Inputs for OP_D.1.(manual mode)
pbLINK_ON_OD1 := LOCK OR LOCK_ON OR QMAN_AUT OR (QMSS_ST AND MSS_OFF)
                 OR (QMON_ERR AND FAULT_OFF);
pbLINK_I_OD1 :=  (LOCK_ON OR (AUTO_ON AND (NOT(QMON_ERR AND FAULT_OFF))))
                 AND (NOT LOCK) AND (NOT(QMSS_ST AND MSS_OFF));
// OP_D.1.
// Outputs of the manual mode for control
IF pbLINK_ON_OD1 THEN
    // Interconnection
    IF MAN_ON = sbI_OD1 THEN
        ; // No  operation occurred
    ELSE;
        pbQOP_ERR := TRUE;
        // Prohibited operator
    END_IF;
    MAN_ON := pbLINK_I_OD1;  // Write pbLINK_I_OD1 back to operator input
    sbQ_OD1 := pbLINK_I_OD1; // Interconnection
    QON_OP := FALSE;         // No operator allowed
    QOFF_OP := FALSE;
ELSE;   // Operator
    IF (sbI_OD1 <> MAN_ON) AND
       NOT ((MAN_ON AND ON_OP_EN) OR (NOT(MAN_ON) AND OFFOP_EN)) THEN
        // Prohibited operator
        pbQOP_ERR := TRUE;
        MAN_ON := sbI_OD1;
    ELSE;   // No or allowed operator
            sbQ_OD1 := MAN_ON;
    END_IF;
    QON_OP := ON_OP_EN;      // Copy the inputs to the outputs
    QOFF_OP := OFFOP_EN;
END_IF;
sbI_OD1 := MAN_ON;           // Note old operating values
QOP_ERR := pbQOP_ERR;        // Operator error
// Watchdog   - 2 -
// Switch the motor on or off within a configured timespan.
IF (( sbALT_QSTART <> QSTART ) AND ( NOT QMON_ERR ))
   // Change through control
THEN
    IF TIME_MON < SAMPLE_T   THEN
        srAktZeit := SAMPLE_T;
    ELSE;
        srAktZeit := TIME_MON;
        // Set acttime
    END_IF;
END_IF;
IF srAktZeit >= SAMPLE_T THEN
    srAktZeit := srAktZeit - SAMPLE_T; // Bring down time
END_IF;
```

```
        IF MONITOR THEN
           // If the monitor is active, the change from Q_START has to be written
             // immediately to the output.
            IF FB_ON = QSTART THEN          // Before the monitor time expires,
                                              // same Feedback and QSTART
                srAktZeit := 0;
                IF QSTART THEN       // Report the corresponding feedback status
                    QRUN := 1;
                ELSE;
                    QSTOP := 1;
                END_IF;
            END_IF;
        END_IF;
        IF srAktZeit < SAMPLE_T  THEN // If the monitor time expires, does the  <=
            IF MONITOR  THEN          // watchdog then < instead function?
                IF ( FB_ON <> QSTART ) AND ( NOT pbQ_OT1 ) THEN
                   // After the monitor time, feedback and QSTART are different
                    QMON_ERR := 1;
                ELSE; END_IF;
            ELSE;
                IF QSTART THEN  // Set QRUN and QSTOP
                    QRUN := 1;
                    QSTOP := 0;
                ELSE;
                    QRUN := 0;
                    QSTOP := 1;
                END_IF;
            END_IF;
        END_IF;
        // Control signal
        sbALT_QSTART := QSTART;
        QGR_ERR := QMON_ERR OR QMSS_ST OR CSF;
        QSTART := sbQ_OD1 AND ((NOT(QMON_ERR AND FAULT_OFF)) OR LOCK_ON);
        QC_QSTART := QC_QSTART_I; // Describe quality output with value of input.
        // Watchdog   - 3 -
        // Set QRUN and QSTOP
        IF QSTART THEN  // Adapt QRUN and QSTOP to the previous value of QSTART.
            QSTOP := 0;
        ELSE;
            QRUN := 0;
        END_IF;
        IF siRUNUPCNT = 0 THEN
            // Initialize alarm
            // pbALARM := (sb_SIG_1 <> QMSS_ST)
            // OR (sb_SIG_2 <>  QMON_ERR) OR (sb_SIG_3 <>  CSF);
            pbALARM :=TRUE;   // Initialization ALARM_8P
        ELSE;
            siRUNUPCNT := siRUNUPCNT - 1;
            QMSG_SUP := TRUE;
            pbALARM := FALSE; // Initialization no ALARM
        END_IF;
    END_IF;
    IF pbALARM THEN           // Call up ALARM_8P
        IF siBA_ID <> BA_ID_LOC THEN
            // STRING variables may not be interconnected to ALARM8_P as auxiliary
              // process values, therefore transferred in ARRAY OF BYTE.
            FOR ERR := 1 TO 32
             DO
                sbyBA_NA[ERR] := 0;    // Delete array as default
            END_FOR;
            ERR := BLKMOV (SRCBLK:= BA_NA,DSTBLK:=sbyBA_NA);
            siBA_ID := BA_ID_LOC;      // Save modified BA_ID
        END_IF;
```

```
        // Call up ALARM_8P with lock logic (MSG_LOCK)
        ALARM_8P_1(     EN_R := TRUE,   // Update the ACKL_STATE output
                        ID := 16#EEEE,  // PMC communication channel
           EV_ID:= MSG_EVID,
           SIG_1:= QMSS_ST,
           SIG_2:= QMON_ERR,
           SIG_3:= CSF,
           SIG_4:= 0,
           SIG_5:= 0,
           SIG_6:= 0,
           SIG_7:= 0,
           SIG_8:= 0,
           SD_1 := sbyBA_NA,
           SD_2 := STEP_NO_LOC,
           SD_3 := BA_ID_LOC,
           SD_4 := AUX_PR04,
           SD_5 := AUX_PR05,
           SD_6 := AUX_PR06,
           SD_7 := AUX_PR07,
           SD_8 := AUX_PR08,
           SD_9 := AUX_PR09,
           SD_10 := AUX_PR10);
        QMSG_ERR := ALARM_8P_1.ERROR;
        MSG_STAT := ALARM_8P_1.STATUS;
        MSG_ACK := ALARM_8P_1.ACK_STATE;
        sb_SIG_1:= QMSS_ST;           // Note historical signals.
        sb_SIG_2:= QMON_ERR;
        sb_SIG_3:= CSF;
        QMSG_SUP := (MSG_STAT = 21);
    END_IF;
    QERR := NOT OK;
    // Power supply of the VSTATUS output variable with the outputs.
    VSTATUS_STR.VSTATUS_LOW_BIT_3 := QMAN_AUT;
    VSTATUS_STR.VSTATUS_LOW_BIT_5 := QMSS_ST;
    VSTATUS_STR.VSTATUS_LOW_BIT_7 := QMON_ERR;
    VSTATUS_STR.VSTATUS_LOW_BIT_8 := LOCK;
    VSTATUS_STR.VSTATUS_LOW_BIT_9 := QRUN;
    VSTATUS_STR.VSTATUS_LOW_BIT_10 := QSTOP;
    VSTATUS_STR.VSTATUS_LOW_BIT_14 := QMSG_SUP;
    VSTATUS_STR.VSTATUS_LOW_BIT_15 := OOS;
    VSTATUS := VSTATUS_LOC;
END_FUNCTION_BLOCK
```

A.3 Valve

```
// @(#) $Header::   L:/PCS7/PCS7LibV51.SW/TechBlocks/VCS/Algorithm/valv$
//Copyright (C) Siemens AG 1995. All Rights Reserved. Confidential

(*------------------------------------------------------------------------------

Order of the part blocks:

1. OP_D.2
2. OP_TRIG.1
3. Watchdog RESET Logic
4. SEL_BOOL.1
5. OP_D.1
6. Watchdog (remaining)
7. XOR
8. MESSAGE

------------------------------------------------------------------------------*)

//PCS 7 Library Vx.x
//Funktion: Single-Drive/Dual-Feedback Valve
//Etikett-Version 3.0
//Makro-Version :V0.92

FUNCTION_BLOCK "VALVE"
TITLE = 'Single-Drive/Dual-Feedback Valve'
//
{
        S7_tasklist:=        'OB100';
        S7_alarm_ui:=       '1';
        S7_m_c:=            'true'
}
AUTHOR:              TECHN61
NAME:                VALVE
VERSION:             '3.0'
FAMILY:              CONTROL
KNOW_HOW_PROTECT

VAR_INPUT
OOS   {S7_visible:='false';
        S7_link:='false';
        S7_m_c:='true';
        S7_string_0:='In Service';
        S7_string_1:='Out of Service'} :    BOOL := 0; // 1= Out of Service
V_LOCK    {S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // 1=Lock to SAVE position
VL_OPEN   {S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // 1=Lock to OPEN
VL_CLOSE     {S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // 1=Lock to CLOSE
AUTO_OC    {S7_dynamic:='true';
        S7_contact:='true'} :   BOOL := 0; // AUTO Mode:1=Open, 0=Close
SS_POS    {S7_dynamic:='true';
        S7_edit:='para';
        S7_m_c:='true'} :   BOOL := 0;     // Safe Position. 1=Open, 0=Close
START_SS     {S7_visible:='false'} :    BOOL := 1; // 1=Start with Safe State Position
                                                   // and Manual Mode.
FAULT_SS     {S7_visible:='false'} :    BOOL := 1; // 1=In Case of fault: Safe State
                                                   // Position.
L_RESET   {S7_dynamic:='true';
        S7_contact:='true'} :   BOOL := 0; // Linkable Input RESET
CSF   {S7_dynamic:='true'} :     BOOL := 0; // Control System Fault 1=External Error
FB_OPEN   {S7_qc:='true';
        S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // Feedback: 1=OPEN
QC_FB_OPEN : BYTE := 16#80;                // Quality Code for FB_OPEN
FB_CLOSE     {S7_qc:='true';
        S7_dynamic:='true';
        S7_m_c:='true'} :   BOOL := 0;     // Feedback: 1=CLOSE
QC_FB_CLOSE : BYTE := 16#80;               // Quality Code for FB_CLOSE
QC_QCONTROL_I : BYTE := 16#80;             // Quality Code for Input QCONTROL
NO_FB_OP     {S7_visible:='false'} :    BOOL := 0; // 1=No Feedback OPEN present
NO_FB_CL     {S7_visible:='false'} :    BOOL := 0; // 1=No Feedback CLOSE present
```

```
MONITOR  {S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='Monitoring=Off';
         S7_string_1:='Monitoring=On'} :     BOOL := 1; // Select: 1=Monitoring ON,
                                                        // 0=Monitoring OFF
NOMON_OP      {S7_visible:='false'} :  BOOL := 0; // 1=No  Monitoring OPEN
NOMON_CL      {S7_visible:='false'} :  BOOL := 0; // 1=No  Monitoring CLOSE
OP_OP_EN      {S7_visible:='false'} :  BOOL := 1; // Enable: 1=Operator may input OPEN
CL_OP_EN      {S7_visible:='false'} :  BOOL := 1; // Enable: 1=Operator may input CLOSE
MANOP_EN      {S7_visible:='false'} :  BOOL := 1; // Enable: 1=Operator may input MANUAL
AUTOP_EN      {S7_visible:='false'} :  BOOL := 1; // Enable: 1=Operator may input AUTO
LIOP_SEL      {S7_contact:='true'}  :  BOOL := 0; // Select: 1=Linking, 0=Operator Active
AUT_L    {S7_dynamic:='true';
         S7_contact:='true'} :   BOOL := 0;  // Linkable Input for MANUAL/AUTO Mode
TIME_MON      {S7_link:='false';
         S7_edit:='para';
         S7_m_c:='true';
         S7_shortcut:='Mon. Time';
         S7_unit:='s'} :     REAL := 3;           // Monitoring Time [s]
SAMPLE_T      {S7_visible:='false';
         S7_sampletime:='true'} :    REAL := 1;   // Sample Time [s]
MSG_EVID      {S7_visible:='false';
         S7_link:='false';
         S7_param :='false';
         S7_server:='alarm_archiv';S7_a_type:='alarm_8p'} :  DWORD := 0; // Message ID
BA_EN    {S7_visible:='false';
         S7_m_c:='true'} :   BOOL := 0;          // Batch Enable
OCCUPIED      {S7_visible:='false';
         S7_m_c:='true'} :   BOOL := 0;          // Occupied by Batch
BA_ID    {S7_visible:='false';
         S7_m_c:='true'} :   DWORD := 0;         // Batch ID
BA_NA    {S7_visible:='false';
         S7_m_c:='true'} :   STRING[32] := '';   // Batch Name
STEP_NO  {S7_visible:='false';
         S7_m_c:='true'} :   DWORD := 0;         // Batch Step Number
RUNUPCYC      {S7_visible:='false';
         S7_link:='false'} :     INT := 3;       // Lag: Number of Run Up Cycles
USTATUS  {S7_visible:='false'} :    WORD := 0;  // User STATUS Bits
END_VAR

VAR_IN_OUT
RESET    {S7_visible:='false';
         S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='0';
         S7_string_1:='Error=Reset'} :   BOOL := 0; // Operator Input Error Reset
MAN_OC   {S7_visible:='false';
         S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='Valve=Close';
         S7_string_1:='Valve=Open'} :    BOOL := 0; // Operator Input: 1=OPEN, 0=CLOSE
AUT_ON_OP    {S7_visible:='false';
         S7_link:='false';
         S7_m_c:='true';
         S7_string_0:='Mode=Manual';
         S7_string_1:='Mode=Auto'} :     BOOL := 0; // Operator Input Mode 1=AUTO,
                                                      // 0= MANUAL
AUX_PR04      {S7_visible:='false'} :    ANY;       // Auxiliary Value 4
AUX_PR05      {S7_visible:='false'} :    ANY;       // Auxiliary Value 5
AUX_PR06      {S7_visible:='false'} :    ANY;       // Auxiliary Value 6
AUX_PR07      {S7_visible:='false'} :    ANY;       // Auxiliary Value 7
AUX_PR08      {S7_visible:='false'} :    ANY;       // Auxiliary Value 8
AUX_PR09      {S7_visible:='false'} :    ANY;       // Auxiliary Value 9
AUX_PR10      {S7_visible:='false'} :    ANY;       // Auxiliary Value 10
END_VAR

VAR_OUTPUT
QERR     {S7_visible:='false';
         S7_m_c:='true'} :   BOOL := 1;      // 1=Error
QCONTROL    {S7_qc:='true';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // Control Output: 0=Standstill
QC_QCONTROL : BYTE := 16#80;                 // Quality Code Output for QCONTROL
QMON_ERR      {S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=Monitoring Error
QGR_ERR  {S7_dynamic:='true';
         S7_contact:='true'} :   BOOL := 0;  // 1=Group Error
QMAN_AUT      {S7_dynamic:='true';
         S7_contact:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=AUTO, 0=MANUAL Mode
QOP_ERR  {S7_visible:='false';
         S7_dynamic:='true'} :    BOOL := 0; // 1=Operator Error
```

```
QOP_OP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // Status: 1=Operator enabled for "OPEN"
QCL_OP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // Status: 1=Operator enabled for "CLOSE"
QAUTOP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // Status: 1=Operator enabled for "AUTO"
QMANOP   {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // Status: 1=Oper. ena. for "MANUAL" Mode
QOPENING     {S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=Valve is Opening
QOPENED  {S7_dynamic:='true';
         S7_contact:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=Valve is OPEN
QCLOSING     {S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=Valve is Closing
QCLOSED  {S7_dynamic:='true';
         S7_contact:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=Valve is CLOSED
QMSG_ERR     {S7_visible:='false';
         S7_dynamic:='true'} :   BOOL := 0;  // 1=Message ERROR
QMSG_SUP     {S7_visible:='false';
         S7_dynamic:='true';
         S7_m_c:='true'} :   BOOL := 0;      // 1=Message Suppression Active
MSG_STAT     {S7_visible:='false';
         S7_dynamic:='true'} :   WORD := 0;  // Message: STATUS Output
MSG_ACK  {S7_visible:='false';
         S7_dynamic:='true'} :   WORD := 0;  // Message: ACK_STATE-output
VSTATUS  {S7_visible:='false';
         S7_m_c:='true'} :   DWORD := 0;     // Status-word
END_VAR

CONST
C_OOS := 0;                  // 1= Out of Service
C_V_LOCK := 0;               // 1=Lock to SAVE position
C_VL_OPEN := 0;              // 1=Lock to OPEN
C_VL_CLOSE := 0;             // 1=Lock to CLOSE
C_AUTO_OC := 0;              // AUTO Mode:1=Open, 0=Close
C_SS_POS := 0;               // Safe Position. 1=Open, 0=Close
C_START_SS := 1;             // 1=Start with Safe State Position and Manual Mode
C_FAULT_SS := 1;             // 1=In Case of Fault: Safe State Position
C_RESET := 0;                // Operator Input Error Reset
C_L_RESET := 0;              // Linkable Input RESET
C_CSF := 0;                  // Control System Fault 1=External Error
C_FB_OPEN := 0;              // Feedback: 1=OPEN
C_QC_FB_OPEN := 16#80;       // Quality Code for FB_OPEN
C_FB_CLOSE := 0;             // Feedback: 1=CLOSE
C_QC_FB_CLOSE := 16#80;      // Quality Code for FB_CLOSE
C_QC_QCONTROL_I := 16#80;    // Quality Code for Input QCONTROL
C_NO_FB_OP := 0;             // 1=No Feedback OPEN present
C_NO_FB_CL := 0;             // 1=No Feedback CLOSE present
C_MONITOR := 1;              // Select: 1=Monitoring ON, 0=Monitoring OFF
C_NOMON_OP := 0;             // 1=No  Monitoring OPEN
C_NOMON_CL := 0;             // 1=No  Monitoring CLOSE
C_MAN_OC := 0;               // Operator Input: 1=OPEN, 0=CLOSE
C_OP_OP_EN := 1;             // Enable 1=Operator may input OPEN
C_CL_OP_EN := 1;             // Enable: 1=Operator may input CLOSE
C_AUT_ON_OP := 0;            // Operator Input Mode 1=AUTO, 0= MANUAL
C_MANOP_EN := 1;             // Enable: 1=Operator may input MANUAL
C_AUTOP_EN := 1;             // Enable: 1=Operator may input AUTO
C_LIOP_SEL := 0;             // Select: 1=Linking, 0=Operator Active
C_AUT_L := 0;                // Linkable Input for  MANUAL/AUTO Mode
C_TIME_MON := 3;             // Monitoring Time [s]
C_SAMPLE_T := 1;             // Sample Time [s]
C_AUX_PR04 := 0;             // Auxiliary Value 4
C_AUX_PR05 := 0;             // Auxiliary Value 5
C_AUX_PR06 := 0;             // Auxiliary Value 6
C_AUX_PR07 := 0;             // Auxiliary Value 7
C_AUX_PR08 := 0;             // Auxiliary Value 8
C_AUX_PR09 := 0;             // Auxiliary Value 9
C_AUX_PR10 := 0;             // Auxiliary Value 10
C_MSG_EVID := 0;             // Message ID
C_BA_EN := 0;                // Batch Enable
C_OCCUPIED := 0;             // Occupied by Batch
C_BA_ID := 0;                // Batch ID
C_BA_NA := '';               // Batch Name
C_STEP_NO := 0;              // Batch Step Number
C_RUNUPCYC := 3;             // Lag: Number of Run Up Cycles
C_USTATUS := 0;              // User STATUS Bits
```

```
C_QERR := 1;                // 1=Error
C_QCONTROL := 0;            // Control Output: 0=Standstill
C_QC_QCONTROL := 16#80;     // Quality Code Output for QCONTROL
C_QMON_ERR := 0;            // 1=Monitoring Error
C_QGR_ERR := 0;             // 1=Group Error
C_QMAN_AUT := 0;            // 1=AUTO, 0=MANUAL Mode
C_QOP_ERR := 0;             // 1=Operator Error
C_QOP_OP := 0;              // Status: 1=Operator enabled for "OPEN"
C_QCL_OP := 0;              // Status: 1=Operator enabled for "CLOSE"
C_QAUTOP := 0;              // Status: 1=Operator enabled for "AUTO"
C_QMANOP := 0;              // Status: 1=Oper. ena. for "MANUAL" Mode
C_QOPENING := 0;            // 1=Valve is Opening
C_QOPENED := 0;             // 1=Valve is OPEN
C_QCLOSING := 0;            // 1=Valve is Closing
C_QCLOSED := 0;             // 1=Valve is CLOSED
C_QMSG_ERR := 0;            // 1=Message ERROR
C_QMSG_SUP := 0;            // 1=Message Suppression Active
C_MSG_STAT := 0;            // Message: STATUS Output
C_MSG_ACK := 0;             // Message: ACK_STATE-output
C_VSTATUS := 0;             // Status-word
END_CONST

// Static variables
VAR
sbRESTART: BOOL := 1;          // First run(Default is1)
 sb_SIG_1: BOOL    := FALSE;   // ALARM_8P signal 1 flag
 sb_SIG_2: BOOL    := FALSE;   // ALARM_8P signal 2 flag

//------------------------- OP_D.2 -----------------------------
sbAUT_ON_OP:   BOOL := C_AUT_ON_OP;  // Flag of old operating value for(I0) (0=MAN)

//------------------------- OP_D.1 -----------------------------
sbMAN_OC:  BOOL := C_MAN_OC;         // Flag of old operating value for(I0) (0=CLOSED)
sbD1_Q_OC: BOOL := FALSE;            // Q Ausgang

//------------------------- OP_TRIG.1  ---------------------------
sbL_RESET: BOOL := C_L_RESET;        // Flag for historical signal L_RESET (LINK_I)

//------------------------- Watchdog-----------------------------
sbOC:      BOOL := FALSE;            // Old values direction
srAKTZEIT: REAL := 0;                // Current time of the on-delay
siRUNUPCNT:    INT := 0;             // Counter for RUNUPCYC editing

//------------------------- ALARM_8P.1 ---------------------------
ALARM_8P_1:    ALARM_8P;           // Multi-instanced ALARM_8P
dwDUMMY: DWORD := 0;               // Stand-by
siBA_ID:   DWORD := 0;             // Old value BA_ID
sbyBA_NA:  ARRAY[1..32] OF BYTE := 32(0);

VSTATUS_LOC : DWORD := 16#0; // Local variable, into which the VSTATUS output is copied.
STEP_NO_LOC : DWORD;         // Local variable, into which the STEP_NO input is copied.
BA_ID_LOC : DWORD;           // Local variable, into which the BA_ID input is copied.

// Variables for STATUSWORT "VSTATUS" and "USTATUS"
VSTATUS_STR AT VSTATUS_LOC :  STRUCT
                                USTATUS : WORD;
                                VSTATUS_LOW_BIT_8 : BOOL;
                                VSTATUS_LOW_BIT_9 : BOOL;
                                VSTATUS_LOW_BIT_10 : BOOL;
                                VSTATUS_LOW_BIT_11 : BOOL;
                                VSTATUS_LOW_BIT_12 : BOOL;
                                VSTATUS_LOW_BIT_13 : BOOL;
                                VSTATUS_LOW_BIT_14 : BOOL;
                                VSTATUS_LOW_BIT_15 : BOOL;
                                VSTATUS_LOW_BIT_0 : BOOL;
                                VSTATUS_LOW_BIT_1 : BOOL;
                                VSTATUS_LOW_BIT_2 : BOOL;
                                VSTATUS_LOW_BIT_3 : BOOL;
                                VSTATUS_LOW_BIT_4 : BOOL;
                                VSTATUS_LOW_BIT_5 : BOOL;
                                VSTATUS_LOW_BIT_6 : BOOL;
                                VSTATUS_LOW_BIT_7 : BOOL;
                              END_STRUCT;
END_VAR

// Temporary variables
VAR_TEMP
TOP_SI:    STRUCT
   EV_CLASS:   BYTE;
   EV_NUM:     BYTE;
   PRIORITY:   BYTE;
   NUM:        BYTE;
```

```
   TYP2_3:      BYTE;
   TYP1:        BYTE;
   ZI1:         WORD;
   ZI2_3:       DWORD;
   END_STRUCT;
START_UP_SI:    STRUCT
   EV_CLASS:    BYTE;
   EV_NUM:      BYTE;
   PRIORITY:    BYTE;
   NUM:         BYTE;
   TYP2_3:      BYTE;
   TYP1:        BYTE;
   ZI1:         WORD;
   ZI2_3:       DWORD;
   END_STRUCT;
ERR :       INT;         // Startup error
pbALARM:    BOOL;        // Call up ALARM_8P
pbM_SUP:    BOOL;        // Message suppression
//--------------------------- SEL_BOOL.1 -------------------------
pbSEL_BOOL_Q:       BOOL;    // SEL_BOOL 1 output
//--------------------------- OP_D.1 and 2 -----------------------
pbQOP_ERR:      BOOL;        // Temporary output value
//--------------------------- OP_TRIG.1   ------------------------
pbRESET:        BOOL;        // RESET (Ausgang Q)
//--------------------------- Watchdog ---------------------------
pbQMON_ERR:         BOOL;    // Watchdog error
pbVerfahren:        BOOL;    // Valve travel
//--------------------------- Feedback ---------------------------
pbFB_OPEN:      BOOL;
pbFB_CLOSE:     BOOL;
END_VAR
BEGIN
    // Write VSTATUS, resave STEP_NO as STEP_NO_LOC, resave BA_ID as BA_ID_LOC.
    // Supply of the VSTATUS output variable with the inputs.
    VSTATUS_STR.VSTATUS_LOW_BIT_0 := OCCUPIED;
    VSTATUS_STR.VSTATUS_LOW_BIT_1 := BA_EN;
    // Supply of the VSTATUS output variable (HIGH BYTE) with the values
      // that come from the user via the input variable USTATUS (from external).
    VSTATUS_STR.USTATUS := USTATUS;
    //Resave STEP_NO as STEP_NO_LOC und resave BA_ID as BA_ID_LOC
    STEP_NO_LOC := STEP_NO; // Resave, due to output of STEP_NO_LOC in ALARM_8P
    BA_ID_LOC := BA_ID;     // Resave, due to output of BA_ID_LOC in ALARM_8P
    ERR := RD_SINFO (TOP_SI := TOP_SI, START_UP_SI := START_UP_SI); // Read out
                                                                    // start info.
    pbM_SUP := FALSE;
    IF TOP_SI.NUM = 100  OR sbRESTART THEN  // Startup or first run
        sbRESTART := FALSE;                 // No first run anymore
        QMON_ERR := C_QMON_ERR;             // No error
        pbALARM :=TRUE;                     // Initialization ALARM_8P
        IF START_SS  THEN                   // At Start SafeStatePosition?
            AUT_ON_OP := false;             // Manual mode
            sbAUT_ON_OP := false;           // Manual mode
            sbMAN_OC := SS_POS;             // Idle position
            MAN_OC := SS_POS;               // Write back idle position
            sbDI_Q_OC := SS_POS;            // Idle position
            srAKTZEIT := 0;                 // Initialize watchdogs time
            QMAN_AUT := C_QMAN_AUT;         // Manual
            QOPENING := C_QOPENING;         // No movement
            QCLOSING := C_QCLOSING;
            sbL_RESET := C_L_RESET;         // No RESET
            RESET := C_RESET;               // No RESET
            QCONTROL := C_QCONTROL;         // Idle position
            QC_QCONTROL := QC_QCONTROL_I;   // Describe quality output with values of
                                              // input.
            QMSG_ERR := C_QMSG_ERR;
            QMSG_SUP := C_QMSG_SUP;
            MSG_STAT := C_MSG_STAT;
            MSG_ACK  := C_MSG_ACK;
            QGR_ERR  := C_QGR_ERR;
            QCL_OP := C_QCL_OP;
            QOP_OP := C_QOP_OP;
            QOP_ERR := C_QOP_ERR;
            QMANOP := C_QMANOP;
            QAUTOP := C_QAUTOP;
        ELSE;
            IF (NOT AUT_ON_OP AND                   // Manual mode
                MONITOR)    THEN                    // Watchdog active
                IF NOT NO_FB_OP AND                 // Feedback OPEN available
                   FB_OPEN  THEN                    // Feedback available
                    MAN_OC := TRUE;                 // Track operator input
                    QCONTROL := (MAN_OC XOR SS_POS);
```

```
                QC_QCONTROL := QC_QCONTROL_I;  // Describe quality output with
                                               // values of input.
                QOPENED := TRUE;
                QOPENING := FALSE;
                QCLOSED := FALSE;
                QCLOSING := FALSE;
            END_IF;
            IF NOT NO_FB_CL AND                // Feedback CLOSE available
               FB_CLOSE    THEN                // Feedback available
                MAN_OC := FALSE;               // Track operator input
                QCONTROL := (MAN_OC XOR SS_POS);
                QC_QCONTROL := QC_QCONTROL_I;  // Describe quality output with
                                               // values of input.
                QOPENED := FALSE;
                QOPENING := FALSE;
                QCLOSED := TRUE;
                QCLOSING := FALSE;
            END_IF;
        END_IF;
        QCL_OP := CL_OP_EN;
        QOP_OP := OP_OP_EN;
    END_IF;
END_IF;
IF TOP_SI.NUM = 100 THEN     // Initialization at startup
    siRUNUPCNT := RUNUPCYC;  // Save the value of the RUNUPCYC input
ELSE;
    // VALVE algorithm
    pbQOP_ERR := FALSE;      // Optimistic initializations
    pbQMON_ERR := FALSE;
    pbVerfahren := FALSE;    // No OPEN/CLOSE operation
    // OP_D.2 (optimized)                          - 1 -
    IF LIOP_SEL THEN
        // Interconnection
        IF AUT_ON_OP = sbAUT_ON_OP THEN
            ;// No operation occurred
        ELSE; // Prohibited operator
            pbQOP_ERR := TRUE;
        END_IF;
        AUT_ON_OP := AUT_L;       // Write AUT_L back to operator input
                                  // (BTRACK is always1).
        QMAN_AUT := AUT_L;        // Interconnection
        QMANOP := FALSE;          // No operation allowed
        QAUTOP := FALSE;
    ELSE;         // Bedienung
        IF (sbAUT_ON_OP <> AUT_ON_OP) AND
           NOT ((AUT_ON_OP AND AUTOP_EN) OR (NOT(AUT_ON_OP) AND MANOP_EN)) THEN
            pbQOP_ERR := TRUE;          // Prohibited operator
            AUT_ON_OP := sbAUT_ON_OP;   // Write back old operating values
        ELSE;                           // No or allowed operation
            QMAN_AUT := AUT_ON_OP;
        END_IF;
        QMANOP := MANOP_EN;         // Copy the inputs to the outputs
        QAUTOP := AUTOP_EN;
    END_IF;
    sbAUT_ON_OP := AUT_ON_OP;       //Note old operating values
    //OP_TRIG.1 (optimized)                       - 2 -
    IF ((L_RESET AND (NOT sbL_RESET)) OR RESET) THEN   // Rising edge was for
                                                       // L_RESET or RESET.
        pbRESET := TRUE;            // RESET
    ELSE;
        pbRESET := FALSE;           // No RESET
    END_IF;
    sbL_RESET := L_RESET;           // Save previous values
    RESET := FALSE;                 // Reset operator-controllable input
    // Watchdog RESET Logic                        - 3 -
    IF QMON_ERR  THEN               // QMON_ERR Flip-Flop
        IF NOT pbRESET THEN
            pbQMON_ERR := TRUE;
        ELSE;
            // pbQMON_ERR bleibt 0
            // pbRESET bleibt wirksam
            IF TIME_MON < SAMPLE_T  THEN // Reposition watchdog time
                srAKTZEIT := SAMPLE_T;
            ELSE;
                srAKTZEIT := TIME_MON;
            END_IF;
        END_IF;
    ELSE;
        // RESET without error not effective
        pbRESET := FALSE;
    END_IF;
    IF V_LOCK OR VL_OPEN OR VL_CLOSE OR (pbQMON_ERR AND FAULT_SS)// SEL_BOOL.1 - 4 -
```

```
THEN
    pbSEL_BOOL_Q := SS_POS;          // Idle position
    IF (NOT V_LOCK) THEN
        IF VL_CLOSE THEN
            pbSEL_BOOL_Q := 0;       // Close valve
        ELSE;
            IF VL_OPEN THEN
                pbSEL_BOOL_Q := 1;   // Open valve
            END_IF;
        END_IF;
    END_IF;
ELSE;
    pbSEL_BOOL_Q := AUTO_OC;         // Automatic value
END_IF;
// OP_D.1 (optimized and expanded with LINK_ON calculation)          - 5 -
IF QMAN_AUT OR V_LOCK OR VL_OPEN OR VL_CLOSE OR (pbQMON_ERR AND FAULT_SS)
                                     // LINK_ON
THEN // Interconnection
    IF MAN_OC = sbMAN_OC THEN
        ; // Keine  Bedienung erfolgt
    ELSE;
        pbQOP_ERR := TRUE;             // Prohibited operator
    END_IF;
    IF sbD1_Q_OC <> pbSEL_BOOL_Q  THEN // Valve travel?
        pbVerfahren := TRUE;
        sbD1_Q_OC := pbSEL_BOOL_Q;     // LINK_I
    END_IF;
    MAN_OC := sbD1_Q_OC;    // Write output back to operator input
                              // (BTRACK is always1).
ELSE;   // Bedienung
    IF (sbMAN_OC <> MAN_OC) AND
       NOT ((MAN_OC AND OP_OP_EN) OR (NOT(MAN_OC) AND CL_OP_EN)) THEN
        pbQOP_ERR := TRUE;             // Prohibited operator
        MAN_OC := sbMAN_OC;
        // Write back old operating values
    ELSE;
        IF sbD1_Q_OC <> MAN_OC  THEN   // Valve travel?
            // Allowed operator
            pbVerfahren := TRUE;
            sbD1_Q_OC := MAN_OC;
        END_IF;
    END_IF;
END_IF;
sbMAN_OC := MAN_OC;    //Note old operating values
IF pbVerfahren         // Valve is traveled -> Reposition watchdog time
THEN
    IF TIME_MON < SAMPLE_T THEN
        srAKTZEIT := SAMPLE_T;
    ELSE;
        srAKTZEIT := TIME_MON;
    END_IF;
END_IF;
```

```
// Watchdog and position display                              - 6 -
IF NOT MONITOR  THEN                 // No feedback watchdogs
    IF (srAKTZEIT >= SAMPLE_T) THEN        // Timer is running
        srAKTZEIT := srAKTZEIT - SAMPLE_T; // Bring down time
        pbFB_OPEN := FALSE;
        pbFB_CLOSE := FALSE;
    ELSE;
        pbFB_OPEN := sbD1_Q_OC;
        pbFB_CLOSE := NOT sbD1_Q_OC;
    END_IF;
ELSE;
    IF NO_FB_OP  THEN   // No limit switch OPEN
        pbFB_OPEN := sbD1_Q_OC;
    ELSE;
        pbFB_OPEN := FB_OPEN;
    END_IF;
    IF NO_FB_CL  THEN   // No limit switch CLOSE
        pbFB_CLOSE := NOT sbD1_Q_OC;
    ELSE;
        pbFB_CLOSE := FB_CLOSE;
    END_IF;
END_IF;
IF MONITOR AND (((sbD1_Q_OC  AND NOT pbFB_OPEN) AND NOT NOMON_OP) OR
   ((NOT sbD1_Q_OC AND NOT pbFB_CLOSE) AND NOT NOMON_CL) OR
   (pbFB_OPEN AND pbFB_CLOSE) AND NOT (NOMON_OP AND NOMON_CL))THEN
    IF (srAKTZEIT < SAMPLE_T) THEN
        pbQMON_ERR := TRUE;
    END_IF;
    IF (srAKTZEIT >= SAMPLE_T) THEN        // Timer is running
        srAKTZEIT := srAKTZEIT - SAMPLE_T; // Bring down time
    END_IF;
ELSE;
    IF (sbD1_Q_OC  AND pbFB_OPEN) OR
       (NOT sbD1_Q_OC AND pbFB_CLOSE) THEN
        srAKTZEIT := 0;    // End position reached-> Reset watchdog time
    END_IF;
END_IF;
QMON_ERR := pbQMON_ERR;
IF QMAN_AUT OR V_LOCK OR VL_OPEN OR VL_CLOSE OR (QMON_ERR AND FAULT_SS) THEN
    // No OPEN/CLOSE operation allowed
    QOP_OP := FALSE;
    QCL_OP := FALSE;
ELSE;
    // Copy the inputs to the outputs
    QOP_OP := OP_OP_EN;
    QCL_OP := CL_OP_EN;
END_IF;
// Position displays
QOPENED  := sbD1_Q_OC AND pbFB_OPEN AND NOT pbFB_CLOSE;
QCLOSED  := NOT sbD1_Q_OC  AND pbFB_CLOSE AND NOT pbFB_OPEN;
IF QOPENED THEN
    QOPENING := FALSE;
ELSE;
    QOPENING := sbD1_Q_OC AND NOT QMON_ERR;
END_IF;
IF QCLOSED THEN
    QCLOSING := FALSE;
ELSE;
    QCLOSING := NOT sbD1_Q_OC  AND NOT QMON_ERR;
END_IF;
QOP_ERR  := pbQOP_ERR;               // Replace outputs
QGR_ERR  := QMON_ERR OR CSF;         // Calculate group monitor error
IF FAULT_SS AND (NOT(V_LOCK OR VL_OPEN OR VL_CLOSE))
THEN // Safe State Position at error?
    QCONTROL := (sbD1_Q_OC XOR SS_POS) AND NOT QMON_ERR;
    QC_QCONTROL := QC_QCONTROL_I;   // Describe quality output with values of
                                      // input
ELSE;
    QCONTROL := (sbD1_Q_OC XOR SS_POS);
    QC_QCONTROL := QC_QCONTROL_I;   // Describe quality output with values of
                                      // input
END_IF;
IF siRUNUPCNT = 0  THEN              // Initialize alarms
    // pbALARM := (sb_SIG_1 <> QMON_ERR) OR (sb_SIG_2 <>  CSF);
    pbALARM :=TRUE;                  // Initialization ALARM_8P
ELSE;
```

```
            pbALARM :=FALSE;                // Initialization no ALARM
            siRUNUPCNT := siRUNUPCNT - 1;
            pbM_SUP := TRUE;
        END_IF;
    END_IF;
    IF pbALARM THEN    // Call up ALARM_8P
        IF siBA_ID <> BA_ID_LOC THEN
            // STRING variables may not be interconnected to ALARM8_P as auxiliary
              // process values, therefore transferred in ARRAY OF BYTE.
            FOR ERR := 1 TO 32
             DO
                sbyBA_NA[ERR] := 0;    // Delete array as default
            END_FOR;
            ERR := BLKMOV (SRCBLK:= BA_NA,DSTBLK:=sbyBA_NA);
            siBA_ID := BA_ID_LOC;      // Save modified BA_ID
        END_IF;

        // Call up ALARM_8P with lock logic (MSG_LOCK)
        ALARM_8P_1(    EN_R := TRUE,   // Update the ACKL_STATE output
                       ID := 16#EEEE,  // PMC communication channel
           EV_ID:= MSG_EVID,
           SIG_1:= QMON_ERR,
           SIG_2:= CSF,
           SIG_3:= 0,
           SIG_4:= 0,
           SIG_5:= 0,
           SIG_6:= 0,
           SIG_7:= 0,
           SIG_8:= 0,
           SD_1 := sbyBA_NA,
           SD_2 := STEP_NO_LOC,
           SD_3 := BA_ID_LOC,
           SD_4 := AUX_PR04,
           SD_5 := AUX_PR05,
           SD_6 := AUX_PR06,
           SD_7 := AUX_PR07,
           SD_8 := AUX_PR08,
           SD_9 := AUX_PR09,
           SD_10 := AUX_PR10);
        QMSG_ERR := ALARM_8P_1.ERROR;
        MSG_STAT := ALARM_8P_1.STATUS;
        MSG_ACK := ALARM_8P_1.ACK_STATE;
        sb_SIG_1:= QMON_ERR;     // Note historical signals
        sb_SIG_2:= CSF;
    END_IF;
    IF (MSG_STAT = 21) THEN      // Block locked
        pbM_SUP := TRUE;
    END_IF;
    QMSG_SUP := pbM_SUP;
    QERR := NOT OK;              // Note negated OK-Flag result in the block

    //Power supply of the VSTATUS output variable with the outputs.
    VSTATUS_STR.VSTATUS_LOW_BIT_3 := QMAN_AUT;
    VSTATUS_STR.VSTATUS_LOW_BIT_7 := QMON_ERR;
    VSTATUS_STR.VSTATUS_LOW_BIT_8 := V_LOCK;
    VSTATUS_STR.VSTATUS_LOW_BIT_9 := QOPENED;
    VSTATUS_STR.VSTATUS_LOW_BIT_10 := QCLOSED;
    VSTATUS_STR.VSTATUS_LOW_BIT_11 := QOPENING;
    VSTATUS_STR.VSTATUS_LOW_BIT_12 := QCLOSING;
    VSTATUS_STR.VSTATUS_LOW_BIT_14 := QMSG_SUP;
    VSTATUS_STR.VSTATUS_LOW_BIT_15 := OOS;
    VSTATUS := VSTATUS_LOC;
END_FUNCTION_BLOCK
```

Glossary

A

Asynchronous OBs

Asynchronous OBs (organization blocks) are called by the operating system of the CPU when asynchronous events occur (for example errors).

AUTHOR

➔ *Block attribute*:

When a block library is used, this contains the library name. It is also used to identify the help file belonging to the library.

B

BATCH *flexible*

A program package for creating complex recipe controls for the entire range from small to large-scale applications.

Block attribute

Using the block attributes (➔ *FUNCTION_BLOCK*, ➔ *TITLE*, ➔ *List of system attributes*, ➔ *AUTHOR*, ➔ *NAME*, ➔ *VERSION*, ➔ *FAMILY*, ➔ *KNOW_HOW_PROTECT*) of the block, you can influence the object properties of your block.

Block header

1. Section of the ➔ *PLC block* with administrative information (➔ *block attributes*).
2. The upper part of the block in the graphic representation in CFC containing the name (block type, block name), comment and the task assignment (run-time property).

Block icon

Symbolic display of the most important information of a ➔ *PLC block*. The corresponding ➔ *faceplate* can be opened with the block icon.

C

CFC

Continuous Function Chart

1. This is a function chart on which blocks can be placed, interconnected, and assigned parameters. A CFC chart consists of 1 to 26 chart partitions each with 6 sheets.
2. Editor for plant-oriented graphic configuration of automation tasks. Using the CFC editor, a complete software structure (CFC chart) can be created from ready-made blocks.

CNT file

Optional part of an online help system. The CNT file contains the contents of the online help system.

Code section

Part of a block containing the algorithm of the block.

D

Declaration section

Part of a block defining the interface of the block and the data it uses internally.

F

Faceplate

Graphic representation of all the elements of a PLC block intended for operator control and monitoring on an OS.

FAMILY

➔ *Block attribute*:

When a block library is used, this contains a common name for a subset of the blocks. FAMILY and ➔ NAME form part of the key for locating the help text of a block in the online help system.

Function (FC)

Specified in IEC 1131–3 as a software unit that provides a single result when it executes (can also be a structured data type) and does not have memory for storing data. The major difference between an FC and an FB is the absence of data storage.

FUNCTION_BLOCK

➔ *Block attribute*:

Contains the symbolic name of the block. This is used to display the name of the block in the SIMATIC Manager and in the CFC chart.

Function block (FB)

According to IEC 1131-3, a function block is a logic block with static data. Using FBs, parameters can be passing in the user program. This makes function blocks suitable for programming frequently repeated complex functions, such as controllers, mode selection. Since the FB has a memory (instance data block), its parameters, for example outputs, can be accessed at any point in the user program.

G

Global script

Within ➔ *WinCC*, global script is the generic term for C functions created by the user that can be used throughout a project and in multiple projects.

Graphics Designer

Graphic editor in ➔ *WinCC* for creating faceplates.

H

HID

Higher-level identifier: This is made up of the name of the plant hierarchy folders that are selected to form part of the name and of the CFC chart and the block in the CFC chart.

I

Initial start

The first time that a block is executed following its instantiation. Following this first execution, the parameters and modes of the block are in a defined state.

K

KNOW_HOW_PROTECT

➔ *Block attribute*:

When this attribute is set, it protects the algorithm of the block from being viewed or modified unless the source file is in the same program.

L

Library

Software package with ➔ *PLC blocks* and/or ➔ *faceplates* grouped according to common features.

M

Message list

From within the run-time system of ➔ *WinCC*, it is possible to display and edit lists of messages. The messages displayed in the lists relate only the currently active project.

Monitoring

Part of the functions of an OS allowing visualization of the process parameters and statuses in various forms (numeric, graphic).

Multiple instance block

A block made up of several blocks. Its instance (data storage) contains the instances (data storage) of the FBs that are called in it.

N

NAME

➔ *Block attribute*:

Contains the symbolic name of the block; identical to ➔ FUNCTION_BLOCK. NAME and ➔ FAMILY form part of the key for locating the help text of a block in the online help system.

O

OK flag

The OK flag is a system-internal variable. If an error occurs during execution of an option, for example overflow with arithmetic operations, the OK flag is changed by the system and passed to the ENO block output.

Operator authorization

The right assigned to the operator to modify the ➔ *PLC block parameter.*

Operator control

Procedure in which the operator changes the value or status of a block. Generally, such operations involve input at the operator station which is then checked and passed to the block on the PLC. Here, the instruction is checked again before is assigned to the block since it is possible that process conditions have changed since the instruction was sent from the OS and received at the PLC.

P

PLC block

An object belonging to a library or a block structure that contains part of the S7 user program. The blocks that are executed in the CPU of a PLC are known as PLC blocks.

Prototype picture

Prototype pictures are used by ➔ *WinCC* to reuse picture components that have already been configured. The prototype picture technique makes use of template pictures that can be included more than once in one or more parent pictures. A prototype is simply a template that only "comes to life" in a real object. An object based on a template is created by instantiation. Several instances (on other words real objects) can be created from a template.

R

Registration file

And ASCII file (.reg) containing all the information such as path, MAP IDs for online help systems, for example to enter a block in the WINDOWS NT registry. Using this registration file, the online help for a selected block can be started in the required language in CFC or in the SIMATIC Manager.

S

SCL

Higher-level programming language for formulating solutions to technological tasks in SIMATIC S7 (similar to PASCAL) complying with the ST (structured text) language specified in IEC 1131–3.

Split Screen Wizard

Component of ➔ *WinCC*: This initializes the monitor and display settings on the OS.

Standard view

➔ *View* of a ➔ *faceplate* in which the most important values of the corresponding ➔ *PLC block* are visualized.

Start info

The start information is part of an organization block (OB). It informs the S7 user in detail of the event that triggered the OB call.

STL

Statement List: Statement List is a textual programming language complying with IEC 1131-3 and resembling machine code.

System attributes for blocks

Special attributes that prepare the ➔ *PLC block* for the connection to the OS or influence the installation of a block in a CFC chart.

System attributes for parameters

Special attributes that influence the display of the parameter in the ➔ *faceplate* or its handling in the CFC chart.

T

TITLE

➔ *Block attribute*:

This information is not evaluated in PCS 7, however, it is displayed in the SIMATIC Manager in the object properties of the block in the comment field.

Trend view

➔ *View* of a ➔ *faceplate* in which the most important values of the corresponding ➔ *PLC block* are visualized over time.

U

UDT

➔ *User-defined data types*

User-defined data types (UDT)

User-defined data types are special data structures that can be used in the entire CPU program after they have been defined. They cam be used like elementary or complex data types in the variable declaration of logic blocks (FCs, FBs, OBs) or as templates for creating data blocks with the same data structure.

V

VERSION

➔ *Block attribute*:

Contains the version number of the block

View

View of a block in which certain values of a PLC block are displayed (for example, trend view, alarm view, standard view etc.).

W

WinCC

Windows Control Center: A software package for plant-oriented graphic development of ➔ *faceplates* and for operator control and monitoring of the PLC.

Index

E

F

G

H

I

L

M

N

O

P

Q

R

S

T

U

V

W

Z